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W. J. JOHNSTON, Editor and Publisher.
T. COMMERFORD MARTIN, JOSEPH WETZLER, } Associate Editors.
WM. A. ROSENBAUM, Asso. Editor Patent Department.
CLARENCE E. STUMP, Business Manager.
WALTER T. HUNT, Advertising Dept.

New England Office, 178 Devonshire Street, Boston.
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**Elevated Railway Experiments.** THE operation of the elevated railroads in this city, by means of electricity instead of steam, is so tempting and apparently simple a problem, that we are not astonished at the persistency with which electricians continue their experiments in this direction. It is some time since Mr. Daft first applied himself to this task, and a short series of trials soon convinced him that an underestimate had been made of the power required to move trains at schedule speed, and which power was inherent in the locomotives now in use. He, therefore, withdrew the motor first placed upon the track, and has now remodeled it to meet the requirements. The trials which have been going on for the last few weeks and those to come will certainly prove of very great interest, and it seems, indeed, probable that the time cannot be far distant when electricity must supersede steam on the elevated railroads, in the same way that it has superseded the horse on so many of our surface roads.

**Naming Scientific Societies.** To secure an appropriate name is often half the battle for a literary or scientific society, and we are glad to see, therefore, that the old English Society of Telegraph Engineers and Electricians has practically decided to call itself hereafter the Institute of Electrical Engineers, thus adopting a name very like that of the sister society in this country, the American Institute of Electrical Engineers. The unanimity of feeling on the subject is evidenced by the remarkable fact that out of the 846 replies to the circular of inquiry on the subject, 837 were in favor of the change. Still, such an expression of opinion might have been expected, as the telegraph work of the body, like the telegraph membership, is but a small part of the whole; and the new title is at once comprehensive and descriptive in a most felicitous manner. The change, moreover, is a recognition in set official phrase of the importance of the great new profession of electrical engineering, and will, we have not the slightest doubt, do much to win for electricity a wider and more appreciative consideration among men of science and men of affairs.

**Storage Batteries Here and Abroad.** A SHORT while ago we had occasion to call attention to the errors which foreigners are apt to fall into who spend a short time with us. From a casual glance at our institutions and practice they are apt to form hasty opinions of our progress. We are again reminded of this by the article which appears in another column from the pen of Mr. G. B. Prescott, Jr., in which the writer draws attention to the statement made by Professor Forbes regarding the present status of storage battery lighting in this country. While undoubtedly well informed generally on all the branches of electrical work among us, Professor Forbes has probably not had sufficient time or opportunity while here to investigate the advance which has been made in the application of the storage battery; and hence the error which he has fallen into in supposing that the accumulator is not appreciated by us to the same extent that it is in England. As Mr. Prescott points out, investigation will show that, on the contrary, a large number of storage battery installations, both isolated, and in connection with central stations, are in operation at the present time; and though little is heard of them, they are still doing work, occupying a useful place in the field of electric lighting. The same remark holds true of the application of the accumulator to traction purposes. There is plenty of work being done in that line also.

**Local Lighting Monopolies.** THE Supreme Court of Pennsylvania has recently decided a very interesting case in regard to attempts to obtain a monopoly of local lighting. The history of the case is that soon after the organization of the first electric light company in Scranton in 1884, the stock was bought up by the president of the local gas and water company. The result was that electric interests were subordinated to those of gas, but a new competing company came into the place and was soon doing a good business. The first company now brought suit on the ground that its charter gave it exclusive rights in Scranton. The lower court decided against this claim, and the appeal court now sustains the court below. It decides that the appellant had no right to have its franchise extended into a monopoly, as it might prove to be, and had been shown to have become, detrimental to the public welfare. It will be remembered that the president of the American Gas Light Association recently advised against local lighting combinations having monopoly as their aim, and up to the present the popular feeling against them has been notably seconded by legal decisions. At the same time there are frequent occasions when a rational desire to insure the stability of investments will lead to efforts in this direction and will be productive of good results in a steady efficiency of service. In Scranton the tendency manifested was altogether of a bad kind, absence of competition meaning the injury and neglect of improved systems of lighting. Such a policy is, in the long run, its own punishment, but here the courts have hastened the process.

**Electric Welding.** THIS process, which may now be said to have risen to the dignity of one of the established arts, has long excited the curiosity of those whose work involves the joining of metals of various kinds; and we know, from personal experience, that the inquiries regarding the progress made in this art are becoming more numerous every day. Aside from the beauty and novelty of the process, the all-important thing to which prospective users look is its efficiency; that is to say, all of those who can apply it are desirous of knowing whether the electric weld is as good as that which has been done heretofore by the ordinary process, or by means of soldering. The answer to this last question is given in the series of tests which we publish in another column, made by the government officials at the Watertown Arsenal, and presented by Mr. C. J. H. Woodbury before the American Society of Mechanical Engineers. These tests show better than anything else that this process has, in the first place, accomplished what has never been done before, in the joining of dissimilar metals; and, in the second place, they prove its entire reliability and superiority over the ordinary methods employed in the joining of iron and steel. This is so well recognized even now, that, as we are informed, electric welding has been introduced into several prominent wire and cable works with marked success. If we add to the item of superiority of work, the economy of the process, which has been shown to be cheaper than that of hand welding, it is not too much to say that, in time, electric welding will practically supersede all methods now in use for all sizes of work to which it can be applied.

**Induction on Telephone Circuits.** ALTHOUGH at the present time we do not hear so much about the troublesome induction on telephone circuits caused by neighboring electric light and power circuits as was formerly the case, the fact remains that the evil still exists in many cases, chiefly because the means for its thorough prevention, *i. e.*, the complete metallic circuit, has not been applied to any extent in this country. But it is interesting to know that so high an authority as Mr. Lockwood has brought out a device which, he claims, effects to a large degree the removal of the pernicious induced currents, at the same time leaving the telephonic or voice currents practically undiminished in volume. The ingenious method by which this is accomplished is the shunting of the receiving telephone by an electro-magnetic device of high self-induction, which permits of a comparatively easy passage of the objectionable induced currents, but, on the contrary, is practically impervious to the telephonic currents, on account of their high rate of vibration, and the consequent counter-currents which they set up in the electro-magnetic shunt. Mr. Lockwood also discerns another advantage in the application of this device, in that it strengthens the power of the transmitter, so that it may be said to perform a double function, which largely increases its value. Mr. Lockwood's device recalls a somewhat similar arrangement of Prof. S. P. Thompson, which consisted of a shunt around the telephone in circuit with a battery, and including a resistance of such a nature as to oppose the passage of the voice currents, while offering practically no opposition to the steady battery currents. This arrangement, however, was employed for the purpose of increasing the sensitiveness of the telephone, but had no reference to the currents induced by neighboring wires.

**The T. M. B. A.** Now the oldest organization of its of its kind in the United States, the Telegraphers' Mutual Benefit Association may well be proud of its condition as exhibited at the annual meeting of last week, of which we give a detailed report on another page. The officers must be congratulated on the state of the Association under their charge, and we cannot refrain from an expression of our admiration at the careful, thorough and successful manner in which the energetic young secretary, Mr. C. P. Bruch, has done his highly responsible work. The statements presented by himself and the other officers show a praiseworthy grasp of the problems that are arising, and the members will be wise in making note of the suggestions offered. President Merrihew's comments on the reserve fund are timely, and although that fund now reaches nearly $75,000, it should be made as large as possible. It can be materially increased without serious tax. At present assessments run about $12 a year, and no one, we think, would feel another $2 or $3, which, after all, would be only about 5 cents a week. Another important point touched upon was that relating to the field from which the membership should be recruited. The fact, not generally known, was brought out that the rules include the telephone as well as the telegraph service; and probably there are still many engaged in telephony who would like to secure the benefit of an insurance of $1,000, which the association affords. The advisability of making a move, so as to include the newer departments of electric light and power, was also touched upon, and we are glad that the subject was agitated. The difficulty that here presents itself is the absence of definite statistics as to the number of those engaged in the work, their length of life, liability to accident, etc.; but, no doubt, fuller information will soon be had. So far as incandescent lighting and most of the new electric railways are concerned, using low current multiple systems, there is, it would seem, not the slightest reason why candidates from their ranks should not be good risks. When it comes to arc lighting, however, somewhat different conditions present themselves, and there are probably many old members who would raise objections based on the real or alleged danger attending the work of those employed in arc lighting or series work generally. Evidently, prudent and conservative handling of the question is called for, but it is an excellent thing that the subject has come under discussion. By the time the next annual meeting comes round, the association, possessed of fuller information, may, perhaps, be ready to consider the claims of new classes of applicants and be prepared to discharge in a fuller degree the opportunities of usefulness which hitherto, subject to earlier restrictions, it has met so splendidly and so well. The Association as it stands to-day is a noble monument to the thrift and thoughtfulness of American telegraphers.

## NEW BOOKS.

THE ELECTRIC MOTOR AND ITS APPLICATIONS. By T. C. Martin and J. Wetzler. Second edition, enlarged. 292 pages; 332 illustrations. New York: W. J. Johnston. Price, $3.

The great interest now taken in the subject of electric motors and the electric transmission of energy is evidenced by the appearance of this work in a second edition. With the exception of Kapp's and Thomson's admirable treatises, dealing more especially with theoretical considerations, this is the only work in the English language in which can be found a résumé of what has been done in the development and utilization of electric motors. The value of the book consists not only in its historical treatment of motors from the beginning of the century, but in its description of the machines invented and introduced during the past five years, in which period the motor has passed from the crude and experimental stage to that in which it is recognized as one of the greatest and most successful agencies for the transmission of energy that the world has ever seen. Some idea of the ground covered may be formed from the fact that the book embraces descriptions, often in minute detail, of about 75 different motors, and of over 50 electric railroads.

With the bulk of this work readers are already familiar, as the first twelve chapters have been reprinted without any change whatsoever. The appendices that appeared in the first edition have, however, been dropped, and in their place are four new chapters running a length of some 80 pages, and profusely illustrated, devoted chiefly to the American and European motors and motor systems exploited since the beginning of 1887. The two chapters alloted to this part show very forcibly the activity that has prevailed, particularly in our own country; and among the more interesting portions of their contents may be specified the Bentley-Knight railway system, Mr. Stephen D. Field's latest work; the Baxter motor; the Short series railway system; the Schlesinger mine railways and the Lugo motor; supplemented by the Pollak and Binswanger railway system; the Immisch motor, and the important Oerlikon transmission trials. But perhaps an even more interesting chapter will be that in which alternating current motors are treated, with an account of the work done in this new field by Prof. Elihu Thomson, Dr. Louis Duncan, Mr. Nikola Tesla, Lieut. Patten, Prof. Ferraris and others. The last of the four new chapters takes up thermo-magnetic motors, and presents a synopsis of the experiments and theory relating to that class of machines. Altogether, the reader of this book may feel confident that when he has assimilated its contents he has an adequate knowledge of what has already been accomplished, and has been given many useful suggestions as to future work in which he may himself have a share.

## Electric Agriculture.

There has been an idea floating in the minds of scientific agriculturists that currents of electricity applied to root crops might have some beneficial effect. Prof. E. Wollny, of Munich, has made some exact experiments on the subject. He took patches of ground 12 feet or 13 feet square, separated by boards penetrating the earth to the depth of a foot. In one case he applied two earth-plates, and interposed five cells; in another, he inserted an induction apparatus; and in a third a plate of copper at one side and a plate of zinc at the other side, to form a natural battery. Peas, potatoes, carrots, etc., were planted on these and other patches, but the electricity, whether of high or low potential, seemed to have either no influence, or a bad one, upon their growth. Prof. Wollny believes the electricity does provoke perturbations on the protoplasm, the more that sap with which the plant is filled is a fair conductor.

## The Daft Elevated Railway Motor "Ben Franklin."

The "Ben Franklin" is again in operation on the Ninth Avenue Elevated Railway in this city, and for some time has been quietly under test with results that are said to be gratifying in the extreme.

It will, no doubt, be remembered by many that this is not the "Franklin's" first appearance, and, though the motor returns differing almost imperceptibly from its old form, it is with, at least, double the tractive capacity, and a few words of explanation are *a propos* at this point.

The "Franklin" of the earlier form was functionally all that could be desired, and afforded as complete a proof as the "Franklin" of to-day can furnish of the feasibility of such a type and size of electrical tractor; but it had not been built of equal power with the steam locomotives in use, and, while handling two cars with sufficient facility, showed indications of overload in the effort of acceleration at starting its train. It was, therefore, decided to withdraw and reconstruct it with a capability equal in all respects to that of the steam locomotives. This work, often interrupted by more pressing claims for apparatus, has consumed the interval between the two appearances.

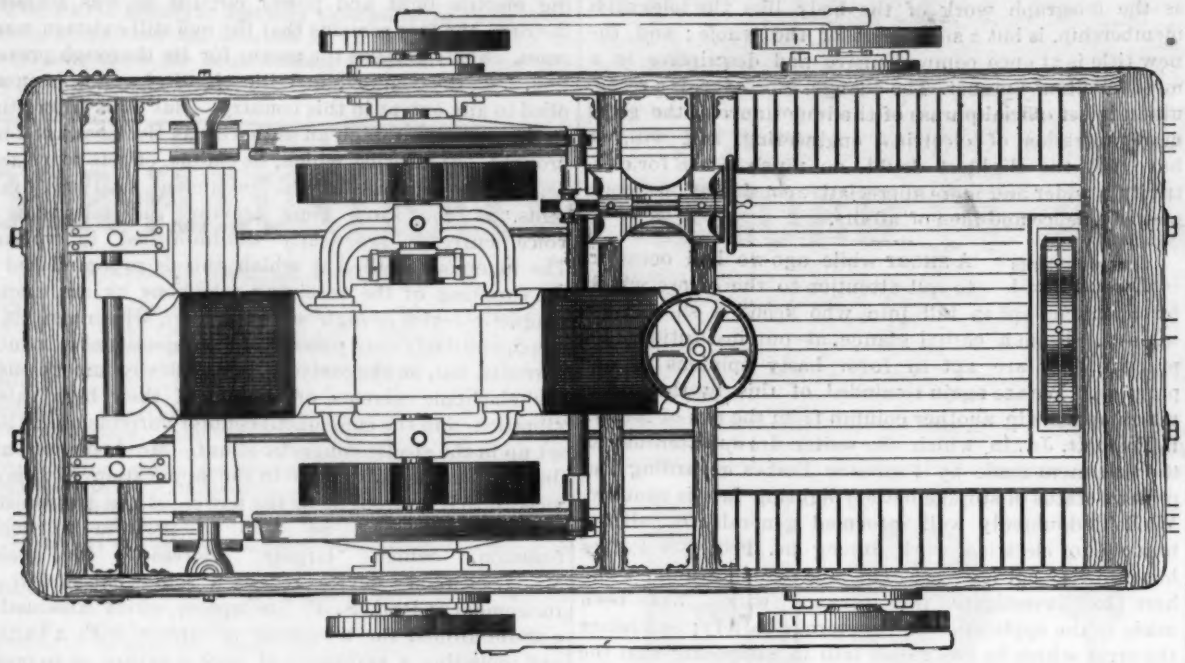


FIG. 1.—THE NEW "BEN FRANKLIN."

While, as stated above, the present "Franklin" has double the power of the earlier, the only external difference is the addition of disc-cranks and connecting-rods, in order to avail of the adhesion to the rails of four wheels instead of two, and the substitution of brushes for the contact-wheel, in conveying the current from the conductor to the motive machinery. The accompanying illustrations, Figs. 1 and 2, show the remodeled motor, with cab removed, both in plan and elevation, respectively.

The difference in the contact arrangement is principally due to the changing of the conductor from an insulated track rail, centrally placed between the two others, to a five-eighths inch copper rod sustained by insulating brackets, secured to the guard-timbers alongside the track. This step was prompted by a desire for a better conductive system than the somewhat primitive makeshift of a third rail, which was also the cause of some inconvenience to the steam locomotives; and to make it without interruption to regular traffic occupied a long time, but was eventually accomplished without accident. The conductor extends from Fourteenth to Fiftieth streets, and measures, on both tracks and sidings, considerably over four miles. The rails, and in fact the entire elevated structure, constitute the return circuit.

The power station, situated in Fifteenth street about 300 yards from the track, is equipped with a steam engine of 250 h. p. and four 50 h. p. dynamos, whose current is led by heavy insulated wires, suspended from telegraph poles, to the copper conductor on the railway structure.

The present trial of the "Franklin" has covered about three weeks, and has been unattended by the slightest casualty or obstacle of any kind. The motor has more than realized the expectation of its designer, and some of its performances were as follows:

The load was increased car by car until eight were in train, aggregating, with the motor, 122 tons; and these it started, ran and stopped easily, promptly, and with every indication of being well within its ultimate capacity. Finally it ascended the maximum gradient in the route, 98 feet per mile, with the eight in tow, at a speed of seven and one-half miles per hour.

The greatest load it was guaranteed to pull was four cars, which, with their seated load of 176 passengers and the motor, amount to 77 tons. With four empty cars, making a train of 66 tons, it has maintained a speed of 25 miles per hour up and down the track for a long period, and with three cars in tow, or 52 tons in train, it has maintained for a similar time a speed of 30 miles per hour.

The outcome of such a notable achievement as the foregoing ought not to be difficult of divination. In the opinion of the Daft Company, it cannot fail to be revolutionary when its full import is appreciated. For they claim that it implies maintaining the existing service on the New York elevated railways at barely more than half the present cost.

Electrical propulsion, in general terms, consists in the convenient transmission of economically generated mechanical power to the desired point of application. Small engines, especially locomotives, are notoriously wasteful of fuel, and nine pounds of coal per horse-power per hour is about the best performance of even a large one of high speed.

A large stationary compound condensing engine of the best type will easily return a horse-power for two pounds of coal, and, even after allowing the extreme loss of 33 per cent. for the conversion of work into current, and vice versa, and the conductive resistance of a circuit of ordinary length, or, in brief, granting a horse-power on the track to cost three pounds of coal, the advantage is too obvious to require lengthy explanation or reference to the various side-issues of diminished attendance and depreciation, less first cost, etc.

## Storage Battery Lighting in America.

BY GEO. B. PRESCOTT, JR.

In a paper entitled "Electric Lighting in America," by Prof. George Forbes, which was read before the British Association for the Advancement of Science at the Bath meeting this year, the following statement will attract the attention of the American reader: "It is a curious thing, for example, that in America there is no work hardly being done with accumulators. There is an example where we have led the way as compared with the Americans. I was struck with the fact in 1884, and still more in the present year, that accumulators do not seem to work in the American atmosphere; at any rate people have been importing numbers of accumulators, and yet they are not recognized as the satisfactory apparatus we have come to regard them as; they are looked upon there as being as uncertain now as they were with us four or five years ago."

For the sake of fairness, the writer, in the light of personally familiar facts, may be permitted to take exception to the foregoing statements. It is true that in England accumulators have been used quite extensively, in connection with isolated plants, which have usually remained under the maintenance and personal supervision of the

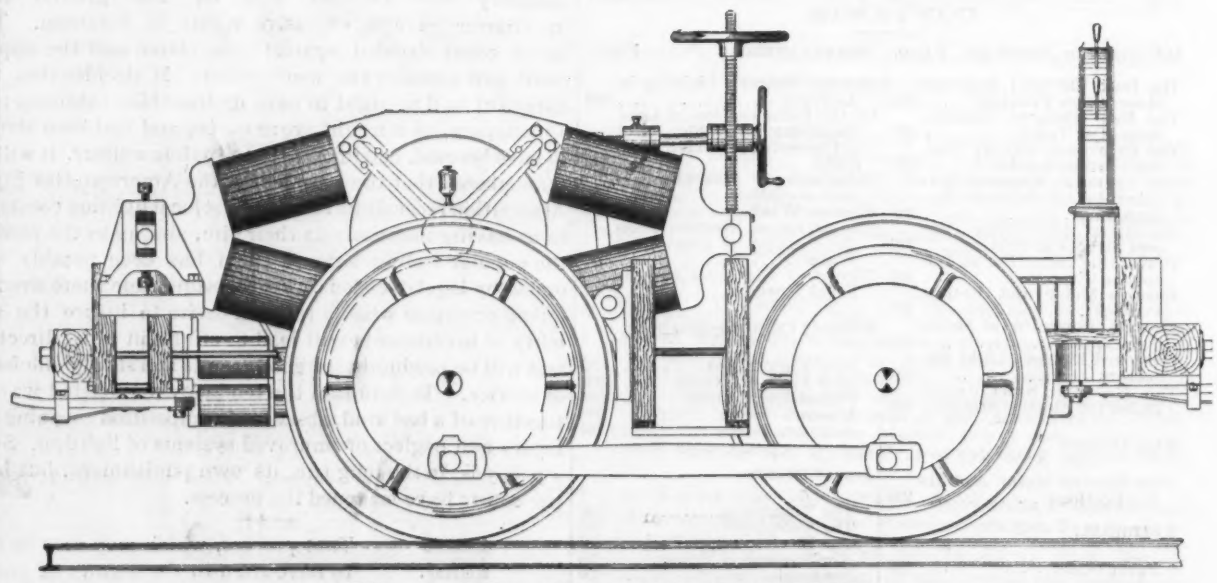
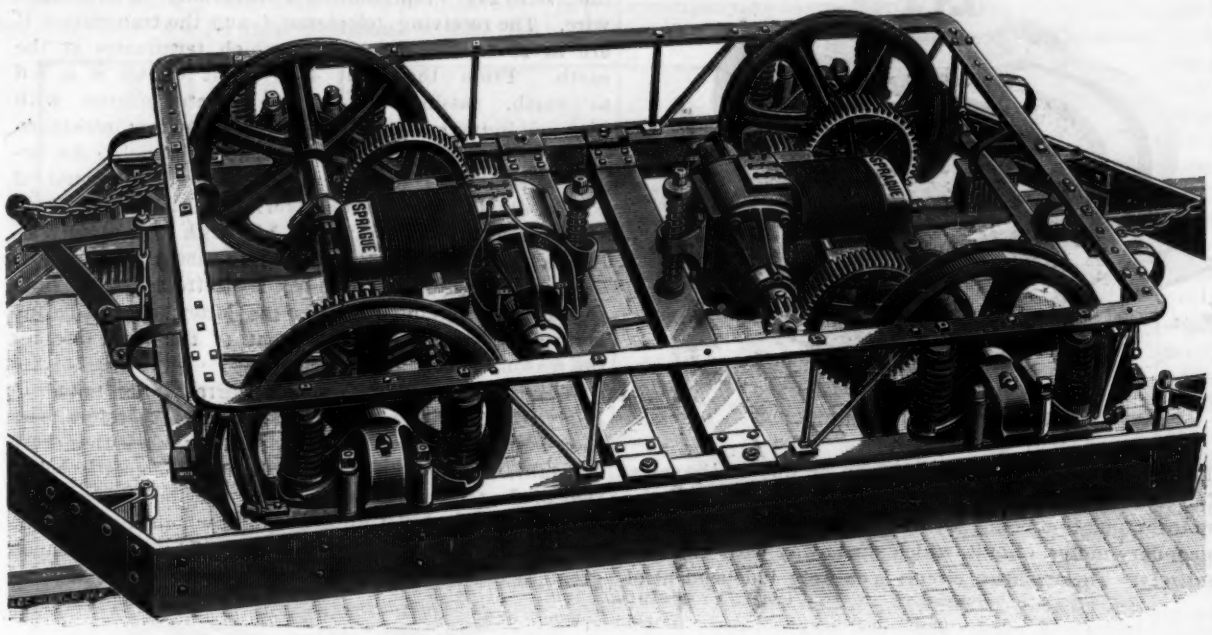


FIG. 2.—THE NEW "BEN FRANKLIN."

erecting engineers. But lighting from central stations by means of accumulators has hitherto been an unworked field in England, and the first practical schemes of that sort, seriously considered, are only just now being projected. In America, on the other hand, accumulators have been installed as auxiliaries to existing isolated plants as largely as in England—notably in New York and Philadelphia—and many such installations throughout the country depend partially, and some wholly upon accumulators for their lighting current. These plants have, moreover, been sold outright to the users, who alone have been responsible for their proper maintenance; and if it is true that accumulators have given better satisfaction in England than in America, this fact should not be overlooked.




NEW SPRAGUE TRUCK FOR STREET CARS.

For the past two years central station accumulator installations have been operated in many of the smaller towns of the United States, where the cost of running a lighting plant during twenty-four hours of the day would have been prohibitory to any direct system. More than this, accumulators have been installed as auxiliaries in many of the central stations of the well-known direct lighting companies, and within the past six months even one of the most prominent of the Westinghouse local companies has equipped its central station with a battery of not less than 300 lights capacity, for the purpose of tiding it over a period of heavy load, during which the boilers and engines are taxed to their utmost capacity. In America the lighting of cars by stored electrical energy has proved a decided and permanent success, batteries being extensively employed for the purpose, while no less than three large concerns are actively exploiting accumulators for traction work.

As it is a well-known fact that Professor Forbes visited this country in the interest of the Westinghouse Company, it is neither surprising nor unreasonable that he should be more familiar with the accomplishments of that enterprising corporation than with the achievements of less prominent manufacturers in the newer field of storage battery lighting. But while the results obtained may be less conspicuous than those which have been effected in the older and more extensively worked field of direct lighting, they are neither so few nor so difficult to discover but that any thorough investigator may easily discern them to be a permanent element in the art of electric lighting as it exists in America in the year 1888.

### The New Sprague Electric Street Car Truck.

At the recent Street Railway Convention, held at Washington, there was exhibited an electric street car truck of the new design of the Sprague Electric Railway and Motor Company. The truck, which is shown in perspective in the accompanying engraving, carries two 15 h. p. motors of the new design, and embodies some novel principles of construction.

Everything is designed for durability and convenience, and to meet all the varied exigencies of street railways. The motors have the regular Sprague mounting, being centred on axles and flexibly supported to prevent accident from sudden strain. They are very compact, and are of the lightest weight consistent with the highest efficiency.

All the most recent improvements in mechanical and electrical design have been adopted which could add to the durability of the apparatus. The armature pinion meshes into an intermediate with vulcanized fibre teeth to insure quiet running, and the pinion of this shaft into the main gear. Split gearing in the intermediate is also used.

Everything is designed for ready replacement and to reduce the attendance and care to a minimum. All bearings are self-oiling and dust proof, and each is independently removable.

The brushes are constructed on an improved plan, and are designed especially for ease of adjustment. Each brush consists of a number of flat, square copper strips, or laminæ, fastened loosely in a holder by a pin passing through their centres. These laminæ set themselves in the direction of rotation, and the surface of the brush contact conforms to the curve of the commutator. By this means the necessary electrical contact is obtained without excessive pressure on the commutator, and all wear is reduced to a minimum. The machine and gears are inclosed in a tight fitting cover, which protects them from dust and injury.

### The Grosvenor Gallery Central Station, London.

For several years past electric currents for lighting purposes have been distributed from the Grosvenor Gallery station of the London Electric Supply Corporation, and it is claimed that this is the first station from which alternating currents were distributed on a commercial basis.

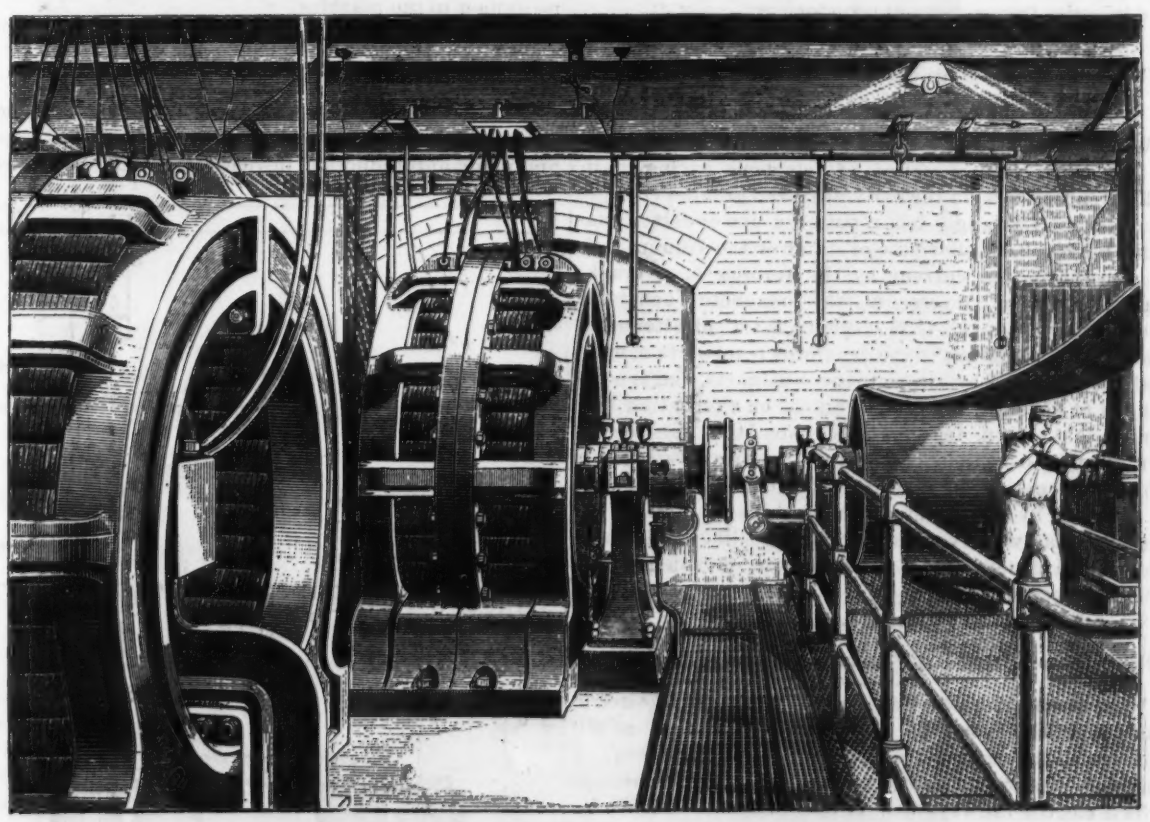
The system employed is that of Mr. S. Z. de Ferranti, and starting with but a few thousand lights the installation has been gradually enlarged until at present the total number of lamps wired for is 35,000 of 10-candle power; but it has hitherto been found that 20,000 represents the maximum number in use at one time, and this number is but rarely exceeded. To supply current for these lights, two Ferranti machines are provided, each of which was designed for 10,000 10 candle-power lamps, but one machine alone has proved itself capable of taking a load of no less than 19,500 lamps without injury. These machines, which are shown in the accompanying engraving, taken from the London *Electrician*, stand 9 feet 6 inches in height, with a floor space 9 feet × 11 feet. The armature is not built up in the way usually associated with the name of Ferranti, but is composed of separate bobbins, after the Siemens type. The coils are wound on laminated cores of gunmetal and German silver, and are composed of copper tape ¼ in. in width by .06 in. in thickness. The tape is slightly corrugated in order to prevent its slipping on the crown of the core, which is also corrugated to receive it. The insulation is wound on with the tape, and consists of hard vulcanized fibre of ¼ mm. thickness. One end of the bobbin is soldered to the core, which is insulated from the frame by blocks of ebonite held in cast-iron clamps. There are forty coils, each consisting of 25 turns, connected 20 in series and two in parallel, so as to keep the points of maximum difference of potential at the opposite extremities of a diameter. The diameter of the armature is 8 feet 6 inches, and its resistance when hot 1.1 ohm, which at 2,400 volts gives a loss of only 7,000 watts, or 1.36 per cent. at the maximum output. The speed is 260 revolutions per minute, which is equal to a peripheral velocity of 6,942 feet per minute. The field-magnets are eighty in number, and are set very close together, forty on either side. The coils are connected in eight parallels, and have a resulting resistance of one ohm nearly. The field magnets weigh 17 tons, the base plate 13 tons, the pulley (diameter 5 feet) weighs 2 tons and the armature one and a half tons.

The exciters are shunt wound Siemens machines, giving 100 volts and 105 ampères; they are coupled direct to the shafts of the Ferrantis. The latest addition to the plant is a twelve-unit Kapp machine, also shunt wound, which is at present used chiefly for lighting the engine room, but is also intended as a stand-by for the exciting current in case of need. Switches are arranged for this purpose. There is a constant oil service for each of these machines; the tank holds 300 gallons, and the circulation is effected by two Worthington pumps. Castor oil is used, and the used oil is returned through two strainers.

The engines are four in number, two being Marshall single-cylinder, horizontal engines, of 35 horse-power nominal; one a coupled engine, similar to the above, capable of developing 500 horse-power actual; and one a Corliss, by Dick, Hargreaves & Co., of 750 horse-power.

The regulation of the dynamos is effected solely by the governing of the engines. Ordinary centrifugal governors of Hartnell's type are used, and the speed is regulated in accordance with the indications of a Cardew voltmeter by means of a weight sliding on a lever arm. Nothing is more striking in the whole installation than the simplicity and effectiveness of the governing arrangement. The Cardew voltmeter is used only as a "voltascope"—that is to say, it is connected with a small transformer, and its indications are on an arbitrary scale.

Coming now to the circuit arrangements and the distributing plant—the current passes direct from the machines to a pair of Sir William Thomson's ampère-balances, capable of measuring 250 ampères. The maximum current taken off each machine is about 210 ampères. The machines are run independently—that is to say, they are no electrically coupled in parallel. The external circuits aret five in number, and the main switches are specially designed by Mr. Ferranti for breaking on the high tension of 2,400 volts. The break is no less than four feet in width, and is made with great rapidity. The main fuses are each about two feet in length, and consists of tin wire, several fine wires being joined in parallel. They are mounted on plugs provided with long ebonite handles, by which they can be readily replaced. It is, however, a very rare event for a fuse to go off.



THE FERRANTI PLANT, GROSVENOR GALLERY, LONDON.

The main wires on the overhead circuit are all of 19/15 strand cable, insulated with rubber and braid, suspended by leather thongs from 17/16 steel cables. The thongs

are about 7 inches in length and ¾ wide. The steel wire is shackled off at each pole, and Johnson & Phillips' well-known oil-cup insulators are now exclusively employed. The insulation resistance of the line amounts as a rule to about 3,500 megohms per mile. On the roof of the gallery is a main derrick, of iron lattice work, designed for twelve separate circuits. On ordinary house-tops iron poles of 3½ inches diameter are employed, and are let into cast-iron sockets in the usual manner. About 400 of these poles have been erected, and over 100 miles of wire have been run, whilst up to the present time not a single breakage has occurred. All streets are invariably crossed at right angles. The return wire is carried over the same line at a vertical distance of one foot below the positive lead, and not the least disturbance is now complained of on adjacent telephone circuits. Branch wires are usually 7/16 strand, and house wires 7/20. The external house wires are enclosed in earthenware piping, which is usually let into the wall. Before joining the transformer they pass through a safety fuse and a main switch. The junction of the primary wires with the transformer is made at the bottom of a deep groove in the outer casing of the transformer, and can only be got at by a screw-driver of extra length.

As a rule, the transformers are designed for 100 volts at the secondary terminals. From these terminals the house wires are taken to the meter, and from the other side of the meter the wires are the property of the customer, and the responsibility of the company ceases.

By far the greatest number of the lamps supplied are 10 candle-power incandescents; there are, however, a few "Sunbeams," and about 14 or 15 arc lamps. Most of the latter are employed by photographers in Regent street, and are regulated by hand. The lamps outside the Haymarket Theatre are of the Brockie-Pell type, and are run two in series from a 100-volt transformer.

## The Colburn Magneto Machine for Telephone Exchanges.

While the small hand magneto generator was found to be sufficient for the operation of telephone exchanges in calling subscribers in the early days, the gradual enlargement of the exchanges has required a power driven machine which shall relieve the operator of the arduous task of generating the current by the turning of a crank. Our illustration represents the magneto generator designed by Messrs. I. W. Colburn & Co., of Fitchburg, Mass. The armature of the generator revolves in a magnetic field created by six permanent magnets, and it is arranged to generate either continuous or alternating currents. As shown in the illustration, the machine is arranged for continuous current work with a commutator. When alternating currents are desired, the commutator is replaced by a collector. The machine requires no attention whatever beyond an occasional oiling, and can be placed at a distance from the exchange convenient to the power if necessary.

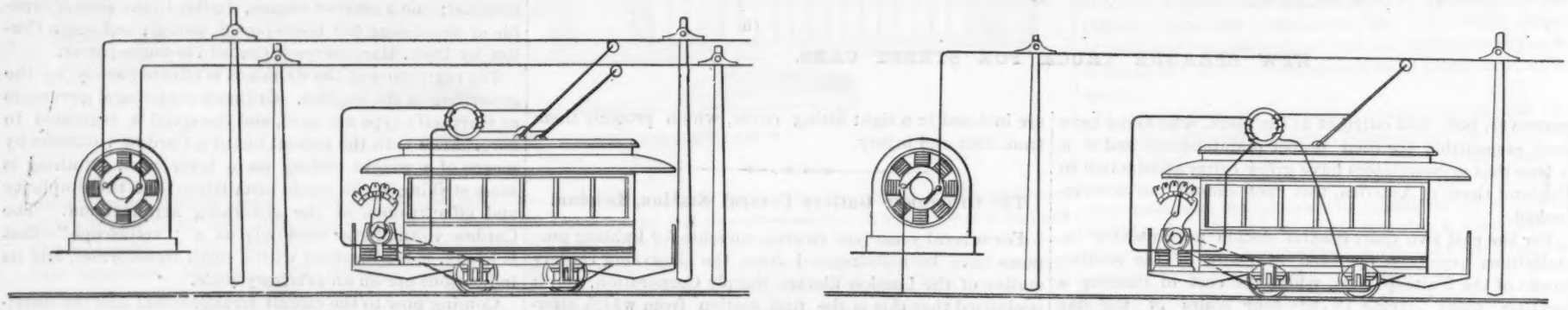
## The Silvey Alternating Current Street Car System.

Notwithstanding that the potential employed in electric railway work has in some cases reached as high as 600 volts with the continuous current, Mr. W. L. Silvey, of Lima, O., has sought to still further extend the distance to which electric railways can be operated economically by devising a high tension alternating system which should at the same time be perfectly safe in its manipulation by the driver.

Mr. Silvey has devised several modifications of his apparatus, among which are the following: First, to use the alternating current to charge a series of converters located on poles along the track, the primaries being all connected in multiple arc to the high tension line and the secondaries all joined in multiple to a secondary line situated directly over the track. In this case trolleys attached to the car convey the current at 40 or 50 volts to the motor on the car. This low tension in the motor makes the matter of insulation a very easy thing, and for this reason the burning out of a motor can be entirely prevented.

Still another way of coupling up the line circuits, and the one Mr. Silvey considers preferable, is shown in Figs. 1 and 2. In Fig. 1 both the outgoing and the return wire are shown overhead, two trolleys being attached to the car. In order to simplify the system still more, the single overhead wire and the return through the rails are employed. In this case the overhead line is fed by the high tension current of an alternating dynamo, one wire being attached to the rail for a return or ground wire, thus saving one-half the line work. The current from the line is conveyed to the car by a trolley, while a converter is located on the car either underneath the floor or under the seats. The secondary wire of the converter is attached to the motor, regulation being secured by a choking coil in the secondary motor circuit, which does away with switches entirely. The armature circuit is entirely independent of the field magnets, and the current in the armature being of so low a tension as three or four volts, there is little or no danger to the machine.

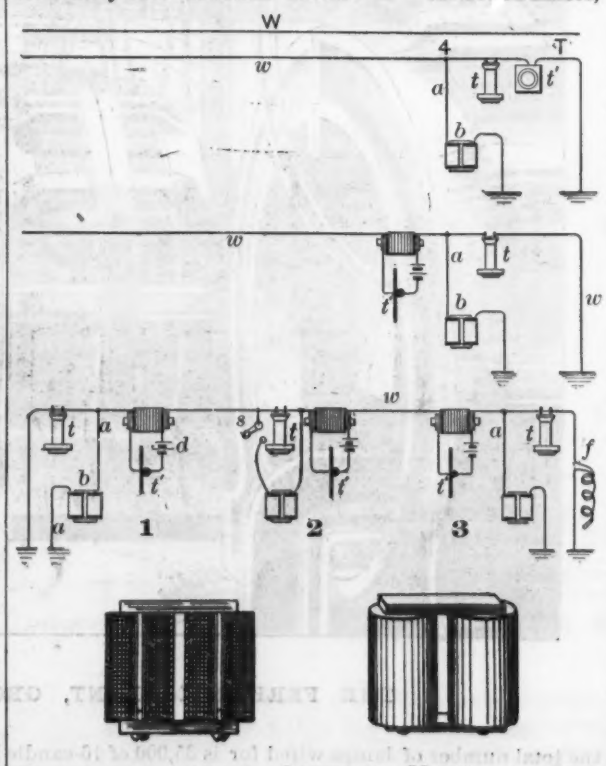
THE COLBURN MAGNETO.



FIGS. 1 AND 2.—SILVEY SYSTEM OF ALTERNATING CURRENT STREET RAILWAYS.

## Preventing Induction on Telephone Circuits.

Electric light and power circuits in cities have made their presence felt on the neighboring telephone circuits and many anti-induction devices or "induction killers," as they are sometimes called, have been designed. The majority of these devices, while diminishing the induction more or less, also diminished the voice current in like proportion, and thus the gain in one direction was offset by the loss in the strength or volume of the sound in the telephone. In an arrangement recently patented by Mr. T. D. Lockwood, of Boston, the well-known telephone expert, not only the evil effects of induction are claimed to be overcome, but in addition the power of the transmitter is said to be increased.




FIGS. 1, 2, 3, 4 AND 5.—LOCKWOOD METHOD OF OVERCOMING INDUCTION ON TELEPHONE CIRCUITS.

The principle upon which Mr. Lockwood's invention is based is, that telephonic currents, by reason of their rapid rate of alternation, pass through electro-magnetic coils with great difficulty, and hence with considerable loss of volume and power, due to the creation of counter currents set up in the coils. It is also based upon the fact that when two routes are open to a current under ordinary conditions, the current will divide between them in the inverse ratio of their resistances.

The various ways in which these principles are applied will be understood by referring to the accompanying illustrations. In Figs. 1, 2 and 3, *w* represents a telephone line, *W* in Fig. 1 representing a disturbing electric light wire. The receiving telephone *t* and the transmitter *t'* are in the telephone circuit which terminates at the earth. From the point 4 a shunt circuit *a* is led to earth, passing through an electro-magnet with high self induction, but of comparatively low resistance compared with that of the telephone branch. An ordinary, steady current flowing in the circuit *w* would, of course, divide at the point 4 inversely in the ratio of resistances of the two branches; but with the rapidly alternating character of the telephonic currents the case is different. The introduction of the electro-magnet *b* into the derived circuit *a* makes the latter practically impervious to the telephonic current of the main line, for the reasons stated above.

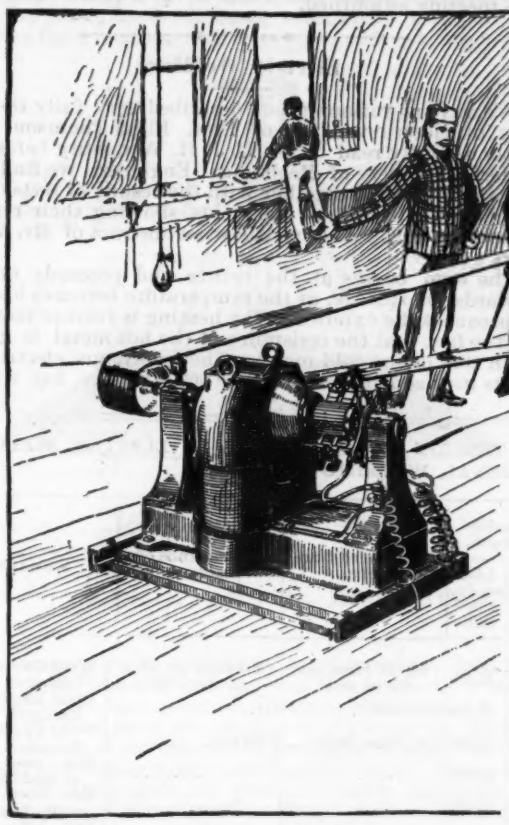
While the disturbing induced currents are not absolutely constant and uniform, and do not, therefore, pass the electro-magnet with as great a facility as if they were constant, still their frequency of change is greatly below that of the telephonic currents, as may be demonstrated from the pitch of the musical sound which they produce in the telephone. As a consequence, they are to a much greater extent amenable to the general law of derived circuits, and the portion of the entire disturbing current which leaks away over the derived circuit is a much greater fraction of the whole than can be the case with the telephonic current. Thus to a great extent the undesirable noises of the telephone are subdued without any appreciable diminution of volume in the reproduced speech; and it has been found in practice that in each individual case the resistance and self-induction of the shunting magnet *b* can without difficulty be so proportioned that the disturbance can be subdued to such a degree as to be scarcely perceptible, while the telephonic current is apparently undiminished in power. Moreover, the electromotive force of the induced or disturbing current is not so high as is that of the telephonic current; hence it loses much more in strength by the interposition of resistance.

The arrangement shown in Fig. 1 has been found an effective suppressor of induction; but it is evident that it materially interferes with the efficiency of the transmitter when the latter is placed as shown; for, while the derived circuit *a* does not materially depreciate the power of the receiving telephone as regards voice-currents, it seriously cripples the power of the transmitter, because the leak through the magnet to earth intercepts the current generated by the transmitter, it being a much shorter circuit from the junction-point through the derived circuit than over the line; while the incoming current, which is required to act on the receiver, does not strike the divergent route through the shunt circuit until the line constituting the greater portion of the circuit is passed over; so that, even though the shunt circuit were a simple resistance, very little, comparatively, of the current would be lost.

It is clear that it is not necessary to shunt both transmitter and receiver. It is the latter appliance only which requires protection from the induced currents, and it has been found preferable to connect the appliances, as shown in Fig. 2, in which the transmitter circuits are shown in in detail. The transmitter connects with the main line through the secondary helix of the induction coil, the primary helix being in circuit with the transmitter proper and the local battery. The derived circuit is in this figure and in practice connected with the line at a point between the secondary coil and the receiving telephone *t*, the transmitter coil being in the outward position—that is, included in the circuit in a position nearer than the receiver to the external portion of the line. So connected, the result is that the noise is hushed down, as in the former case, the major part of the disturbing current leaking away through the shunt. The telephone current is not materially lessened, any slight depreciation in volume being fully made up by increased sharpness and by the quietness of the line, and, the sec-

ondary transmitter coil being now uncontrolled by the shunt, the power of the transmitter is now actually greater than when connected as usual.

Mr. Lockwood accounts for the fact that the power of the transmitter is actually increased under the above conditions in the following manner: In the first place, the two branches in the rear of the transmitter coil furnish two routes to earth, and thus effectually guarantee that the resistance of the earth terminal of the line shall be kept down; and in the second place a telephone transmitter coil so located has a greater tendency to propagate the impulses it develops n a forward direction, because the



THOMSON-HOUSTON MOTOR DRIVING A ROTARY PUMP.

two routes in its rear both include an electro-magnetic coil, and therefore both act as a dam upon the current in the direction of the ground end. It is therefore a decided advantage in several ways to branch the shunt wire from a point between the transmitter and receiver coils and to provide that the former shall be outermost.

In Fig. 3 is represented a line having three stations, two of which, 1 and 3, are terminal, while one, 2, is way. It is obviously impracticable to establish an earth shunt including a suitable electro-magnet at way stations. Therefore, although an earth branch or shunt is to be preferred, the inventor employs at way-stations a loop-shunt around the telephone helix only. The shunt extends from a point through the electro-magnetic shunt *b* to a point on the other side of the telephone *t*. In order that during the day time, when electric light induction is not ordinarily prevalent, the shunt may, if desired, be thrown off for the purpose of obtaining the full value of the telephone, there is provided a switch *s* in the shunt circuit.

In some cases, where the electric lighting current is generated by dynamos rotating at a very high rate of speed, it is found that the rate of change per unit of time of the induced current is also much higher. This, of course, brings the rate near to that of the telephonic current. When this occurs it becomes necessary to provide an electro-magnetic shunt *b*, the resistance of which is materially lower than would otherwise be required. When the shunt is so low that a further reduction would too greatly weaken the telephone current, a resistance coil differentially wound is introduced into the circuit at *f*. In practice this achieves the desired end and diminishes the induction currents in a much greater degree than it does the legitimate or voice currents.

In Figs. 4 and 5 is shown one form of electro-magnet well adapted for inclusion in the derived circuit. It is composed of two spools of insulated wire, the helices of the two being connected in series. Each has a soft-iron core, and the cores are united at both ends by iron plates, thus closing the magnetic circuit. Each spool has also an inclosing case of iron.

In practice with the average telephone line Mr. Lockwood has found the best results, both with respect to the reduction of disturbance and the maintenance of the efficiency of the talking, to accrue from a small and short coil measuring about ten ohms resistance, provided with an iron external sheath, iron discs inclosing the ends and a solid iron core, the coil being about one and a half inch long and one and one-eighth inch thick externally. This coil was wound with No. 26 Brown & Sharpe silk-covered wire.

### Electric Motor and Rotary Pump.

The advantages of the electric motor for driving machinery of all kinds are so evident as to require no reiteration at this time. For pumping purposes, especially, the convenient electric motor is coming into use more and more, and the rotary pump is evidently admirably adapted for direct connection to this class of motors. In the hand-some descriptive catalogue of the pumps manufactured by the Goulds Manufacturing Company, we note the accompanying illustration of a rotary pump attached to a Thomson motor. The modus operandi is so clear as to require no detailed description on our part.

### Electric Power in a Straw Hat Factory.

A striking instance of the manner in which steam power has been supplanted by the electric motor is shown in the accompanying engraving:

It represents a Thomson-Houston motor in the straw hat manufactory of E. Newell, Providence, R. I., where previously a steam engine had been used. The entire factory is operated by this motor, though but three of the hat machines are shown.

### On the Deterioration of Lead Sheathing on Cables Laid in Creosoted Wooden Conduits.

BY ROBT. H. ENGLE.

Among the many conduits devised none appear so antagonistic to lead-encased cables as those constructed of creosoted wood. Ordinarily they are constructed in sections of about 20 feet each and divided into numerous rectangular compartments, each of which is designed as a receptacle for a cable, which is pulled through by a rope from man-hole to man-hole, usually the distance of a square apart. Owing to the friction of the wood on the lead encasing in drawing it through, these compartments must of necessity be much larger than the diameter of the cable, and in consequence form a reservoir for the accumulation of vapors and gases. In a very short time a chemical action takes place between the wood, of which the conduits are made, and the crude creosote with which they are saturated, or kyanized, and there is set free acetic acid and carbonic acid gas. The reaction of these two chemical agents upon the lead may be expressed by the following equations:

$$Pb + 2C_2H_4O_2 = C_4H_6PbO_4 + 2H.$$

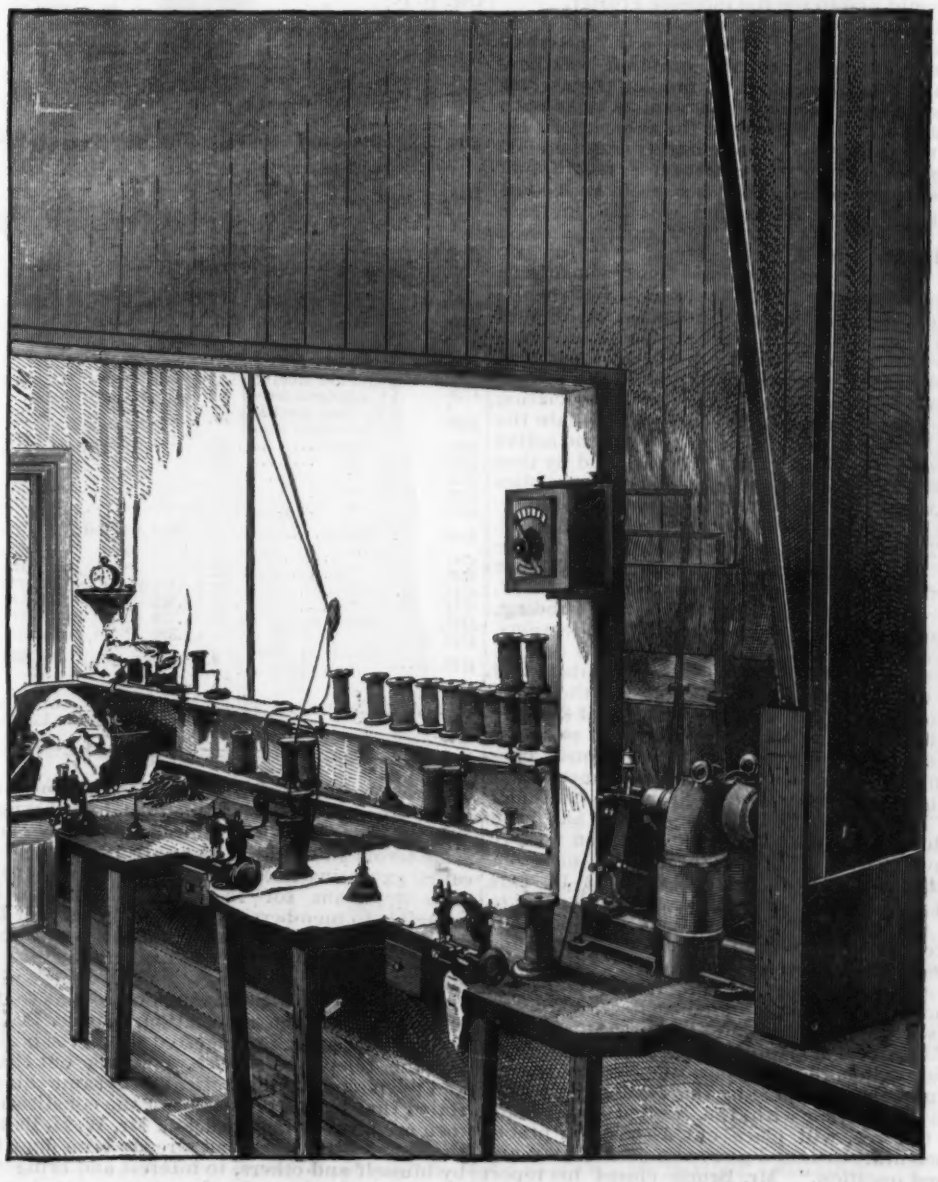
$$C_4H_6PbO_4 + 2H + CO_2 = PbCO_3 + C_2H_4O_2 + C_2H_4 + O.$$

To express the reaction in words to those who may be uninitiated in chemical nomenclature: The first member of the first equation, lead (Pb), combines with the acetic acid ($C_2H_4O_2$) formed from the action of creosote on wood; the second member to form acetate of lead ($C_4H_6Pb\,O_4$) and hydrogen (H). In the second equation, lead acetate plus hydrogen plus carbonic acid gas ($CO_2$) set free in the conduit during the formation of acetic acid, unite to form carbonate of lead ($PbCO_3$), acetic acid, oleflant ($C_2H_4$) and oxygen (O) gas.

The acetic acid acts upon the lead, converting its surface into a film of acetate of lead, which, as soon as formed, is acted upon by the free carbonic acid gas, converting it into carbonate of lead, releasing free acetic acid, which attacks the next layer of lead below the one already acted upon, and so on, until the entire sheathing is converted into carbonate or white lead. These creosoted conduits are, therefore, practically underground white lead factories on an extended scale—"electrical conduits" seems to be a misnomer for them. Many have been the devices and suggestions to allay this chemical action, but no one seems to have arrived at anything that is at once economical, effective and practical. Some suggest that a sheathing be made of an alloy of lead and tin that would effectually resist the chemical action going on. This would require an alloy holding a heavy percentage of tin, and while it might be effective it would neither be economical nor practical; not economical for the reason that the first cost would be too great, and not practical because a sheathing composed of an alloy requisite to resist the corrosive action would be so hard that the cable would be very rigid, especially cables of large diameters.

A great deal of my time has been taken up by laboratory experiments on the subject of finding a way to protect pure lead from these corrosive vapors and gases.

The fruit of these experiments is a compound that resists this chemical action. This compound by a very simple process is applied to the lead sheathing during the process of encasing the cable, adheres intimately to the lead when of the proper consistency, is perfectly pliable regardless of temperature, and will not crack or peel off. In addition to all of these sterling qualities it has also the advantage of being a perfect insulator. Messrs. Tatham & Bros., cable manufacturers, of Philadelphia, will apply this compound to all of their cables that are to be laid in creosoted wood. Some no doubt will surmise that my



THOMSON-HOUSTON MOTOR IN A HAT FACTORY.

compound is rubber or some of its compounds; to those, suffice it to say that rubber in no form enters into its composition. It is composed of mineral substances and hydrocarbons. This material is inexpensive both in its first cost and in its application as a protective covering to lead, and seems to solve the problem of effectually protecting lead from corrosion in creosoted conduits.

### Telegraphers' Mutual Benefit Association.

The annual meeting of the Telegraphers' Mutual Benefit Association was held in the president's room, Western Union Building, 195 Broadway, at 4 o'clock P. M., on Wednesday, Nov. 21. There was a large attendance of members, including the following:

W. H. Young, Washington, D. C.; S. M. Wall, Atlanta, Ga.; H. E. Rawson, Columbus, O.; E. S. Swift, Indianapolis, Ind.; Chas. Smith, Louisville, Ky.; W. H. Runyeon, Reading, Pa.; J. W. Tillinghast, Buffalo, N. Y.; J. G. Tomlinson, Wheeling, W. Va.; M. M. Prescott, Pittsburgh, Pa.; J. W. McLean, Baltimore, Md.; S. S. Garwood, Philadelphia; F. W. Griffin, Philadelphia; J. A. Van Dusen, Jersey City; T. D. Lockwood, Boston; J. D. Reid, H. Smith, J. B. Taltavall; G. Irving, J. L. Edwards, D. C. Sullivan, Dr. J. C. Clark, E. F. Cummings, R. G. Stephenson, T. C. Martin, M. J. O'Leary, D. W. McAneeny, Wm. Holmes, W. L. Ives, W. H. Baker, L. S. Jones, R. W. Pope, W. J. Hamilton, C. H. Jennings, D. C. Donohue, T. R. Taltavall, W. J. Dealy, G. W. Logan, T. P. Scully, G. W. E. Atkins, G. F. Fagan, Chas. P. Burch, Lewis Dresdner, T. E. Fleming, A. M. Guest, B. L. Brunnon, T. A Brooks.

Mr. W. H. Young, vice-president, was called to the chair. A report was read from the president stating that the association had made a net increase of 164 in membership, and pointed out that this prosperity was not without its responsibilities. The members must not forget, he said, that every addition to their ranks added $1,000 to the association's liability, and they must take care to be ready to meet the claim whenever it should accrue. During the fiscal year just past there had been 33 deaths of members, whose average age was 44.73 years, and the average duration of whose membership was 10 years and 10 months. Although 12 assessments had been levied, the executive committee had been able to add to the reserve fund only $8,000. To hold the association in as good a financial position as it was in during the last year by maintaining a 2 per cent. reserve, required $3,280, on account of the net gain in membership, so that they had increased the reserve during the year by a net $4,720, about one-seventh of 1 per cent. of the insurance carried, over the reserve that they held at the beginning of the year. Mr. Merrihew would like to see the increase greater.

There was no longer any doubt or discussion as to the desirability of a reserve fund. It had already more than paid their running expenses, and the question was how they should make it large enough to protect themselves from the increasing loss that would come upon them with the advancing age of the members of the association. He insisted upon the point that the monthly assessments should never be omitted; on the contrary, if they found that 12 assessments per annum did not yield an income sufficiently large to meet losses and steadily increase the reserve, assessments to the number fixed by the by-laws should be levied. "In no other equally good organization can insurance be had more cheaply than in ours; but while it is essential that our dues be not excessive, we should not sacrifice our future welfare for the sake of saving a few dollars yearly in the present. I do not mean that there is cause for alarm as to our condition. There is not. We are to-day on as firm a basis as any similar association in the country. But, if the association is to maintain the high standing that it has attained, it must have the active aid of every member." This report was followed by that of the secretary, supplementing substantially the statistics above given. Mr. Bruch's report showed a total membership in the first division of 3,397, and in the second division of 476. There have been 319 applications in the first division during the year, of which 282 new were accepted, 8 old members were restored, 11 were rejected, 7 were withdrawn, 11 were pending. In the second division there have been 73 applications, of which 71 were accepted. The year showed 33 deaths, or ten per thousand of membership. Ninety members had lapsed, and 3 had resigned. With regard to the views expressed by the president as to the desirability of steadily increasing the reserve fund, Mr. Bruch's report said that the executive committee, and those who had seriously considered the question, coincided in those sentiments. If the practice which had been approved by the National Convention of Mutual Benefit Life Associations had been followed by this association from its start, the reserve fund would now be over $132,000; but taking into consideration the fact that it is only during the past 10 years that a settled policy has been pursued with regard to reserve they need not be discouraged to find that they had accumulated only $72,700. "The addition of the interest to the reserve fund would materially aid this growth. It might be wise to instruct the incoming committee to this effect, and when the reserve has been brought up to an amount equal to 25 per cent. of the total mortality losses, the adoption of a by-law providing for the systematic increase of the reserve in the manner indicated by the National Convention, taken in connection with the limited and graded rates already in force, will place our association practically upon a scientific basis and assure its permanence and solvency beyond question." Mr. Bruch closed his report by mentioning the fact that the body was now the oldest assessment insurance association in the United States, and said, "Looking back over the record of twenty-one years, during which time not one proper claim of the 363 that have been presented has failed of prompt payment, the older members, who organized the association, and we, who have aided in carrying it on, have a right to be proud of its position as the oldest organization of the kind, and to congratulate ourselves upon the success that has been attained." The treasurer's report showed gross receipts for the first division, with balance brought forward, of $49,324.07, and total disbursements of $49,280.43; leaving a cash balance in hand of $43.64. The second division showed gross receipts of $2,459.96, and gross disbursements $1,963.55; leaving a cash balance of $496.41. The market value of the securities etc., belonging to the reserve fund was shown to be $73,430. The reserve includes Western Union 7 per cent. bonds, Gold and Stock 6 per cent., New York & New Jersey Telephone Company's 6 per cent. bonds; mortgages on Brooklyn and Pelham, N. Y., real estate; $15,000 special deposit with the Western Union Telegraph Company, and $3,300 held for investment by order of the Executive Committee. The death claims paid in the first division during the year amounted to $34,000, and those in the second division to $1,692. The general expenses of the association had been $3,796.08 for the year, of which amount $297 figured as the new commission to agents. All these reports were duly accepted.

The following officers were unanimously re-elected: President, James Merrihew; vice-president, W. H. Young; secretary, Charles P. Bruch; treasurer, G. W. E. Atkins; Executive Committee, James Merrihew, New York; G. W. E. Atkins, New York; W. B. Gill, Philadelphia; Charles P. Bruch, New York; Joseph Uhrig, Chicago; W. H. Young, Washington; Joseph L. Edwards, New York; C. W. Hammond, St. Louis; W. H. Jackson, New York; Auditing Committee, S. S. Garwood (chairman), Philadelphia; W. J. Dealy, New York; M. J. O'Leary, New York.

The meeting then proceeded to take up the proposed amendments to the constitution and by-laws. The first of these was with regard to the medical director. It was proposed to add to section 1 of the by-laws the following clause: "The medical director shall examine and make recommendations upon all applications for membership." It was decided to allow the present system of examination, which has proved satisfactory, to continue, and upon permission being given, the proposed amendment was withdrawn. The next proposed amendment taken up was that affecting section 7 of the by-laws, as follows: "Any person of good moral character, who has forfeited membership through non-payment of dues, may be restored to membership upon the same terms and conditions as are required of new applicants, excepting that the entrance fee shall be $4, and that such applicant for restoration shall not be rendered ineligible to membership by reason of not being in telegraphic service." This amendment was adopted, and a change of similar effect was made in Section 6 of the by-laws.

An interesting little discussion arose as to the scope of membership in the association. Mr. T. D. Lockwood, in an excellent speech, suggested the advisability of including the telephone service, pointing out that telegraphy and telephony were practically the same thing. Mr. Bruch stated that by the provisions of the constitution telephone men are already included, and Mr. W. H. Baker remarked that some little work had already been done in New York by himself and others, to interest and bring in telephone men. Mr. Lockwood, who was supported in his views by Mr. J. B. Taltavall, replied that very little publicity had been given to the fact, and he believed that if it were more widely known considerable accessions from the telephone ranks would be obtained. In the course of further discussion, Mr. Martin referred to the point that telegraphy and telephony were now but a small portion of the electrical field, and he thought that perhaps in time it would be well to go beyond the telegraphic and telephonic services for members. At the same time he advised a careful and conservative policy in this respect until such statistics could be obtained as would warrant and justify them in taking the step. He believed that some such action would be found advisable and desirable in the near future, but it should not be taken without thorough consideration nor without the fullest information. Mr. Dealy did not see why membership as it now stood should not include those who were engaged in electrical manufactories; if such persons were not eligible, he wanted to know why they were not. Mr. Lockwood remarked that he thought the object of the association was to limit its benefits to those who were directly concerned in telegraphic service, or whose work was directly related to it, and he hardly thought that such an interpretation would include machinists; besides, while some classes of the electrical manufactures might be included, there might be objection to others. They might be willing to take in men who had to do with the construction of bells, telephones, etc.; but when it came to dynamos of high electromotive force, that would be a different matter. After a little further informal chat and discussion the meeting adjourned.

### Electric Welding.

We have at various times described very fully the process of electric welding of Prof. Elihu Thomson. In a paper recently read by Mr. C. J. H. Woodbury before the American Society of Mechanical Engineers, we find some additional details, together with the results of tests on the mechanical strength of the welds, showing their remarkable character. We give below an abstract of Mr. Woodbury's paper:

The weld begins at the centre and proceeds radially towards the surface, as the temperature becomes less as it approaches the exterior. The heating is further increased by the fact that the resistance of the hot metal is greater than that of the cold metal. The enormous electric currents used sometimes reach 50,000 amperes, but with an E. M. F. of half a volt, and therefore not capable of giving any sensation to a person.

The operator must understand the color of the proper welding heat of the metal under treatment, but this is readily learned. The work is not manipulated during the process, except when it is desired to reduce the burr at the weld. It is at all times under observation, and its heat subject to entire control by means of a lever which graduates the strength of the current. The dynamo generating the electricity is self-regulating and requires no attention except for lubrication.

There is no unnecessary waste of fuel, and heating being local, not extending far from the weld, cotton covered wire ¼ inch in diameter can be welded without searing the insulation over ¾ inch from the weld.

The time for making a weld varies from a fraction of a second to about two minutes, according to the work, although nothing over two inches in diameter has yet been welded; but larger machines are in process of construction. It is not necessary to provide motive power fully equal to the maximum demand, as the time is so short that the momentum of a fly-wheel will serve the same purpose as in a drop press, and give up the surplus energy required. The power is inversely proportional to the time, and appears to be about proportional to the 2.3 power of the diameter in inches, with a slight variation in favor of quick work caused by differences in rates of thermal conductivity of the material.

The process is far cheaper than that of hand welding, and also extends to other methods of manufacture, but the comparative expense differs according to the previous conditions in every place where it has been applied thus far. Its applications in practical work thus far have been confined to butt welding for many purposes, such as continuous wire work, carriage work, axles and tires, cotton bale ties, barrel hoops and wire cables and many miscellaneous purposes. Axes are made of drop forgings,

ORDNANCE DEPARTMENT, U. S. A. REPORTS OF TESTS BY TENSION OF BARS JOINED BY ELECTRIC WELDS, AT THE TESTING MACHINE, U. S. ARSENAL, WATERTOWN, MASS.

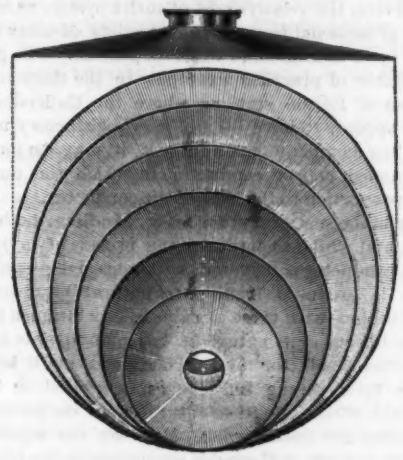
| Test No. | Marks. | Metal. | Total length. | Sectional areas. At weld. | Sectional areas. Of bar. | Tensile strength. Total lbs. | Tensile strength. Lbs. sq. in. in bar. | Position of fracture. | Appearance of fracture. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ins. | Ins.. Sq. in. | Ins. Sq. in. | | | | | |
| 4695. | ..... | Wrought iron.. | 31.75 | 1.74 diam. = 2.39 | 1.50 diam. = 1.77 | 79,640 | 45,070 | 3½ in. from middle of weld.... | Fibrous gr. spot at circumfer.. | Weld finished with hammer. |
| 4696. | ..... | " .. | 36.25 | 1.22 " 1.17 | 1.24 1.21 | 57,900 | 49,500 | At weld..... | Gr..... | Weld finished with hammer. |
| 4697. | ..... | " .. | 36. | 1.00 " 7.85 | 1.00 7.85 | 42,690 | 54,380 | 3 in. from weld.... | Fibrous..... | Weld finished with hammer. |
| 4698. | ..... | " .. | 11.9 | Not welded..... | 1.02 × .40 = .408 | 21,920 | 53,730 | ..... | " ..... | Has been heated at middle. |
| 4699. | ..... | " .. | 11.9 | " ..... | 1.02 × .40 = .408 | 21,840 | 53,530 | ..... | " ..... | Has been heated at middle. |
| 4700. | ..... | " .. | 11.9 | " ..... | 1.02 × .40 = .408 | 22,780 | 55,830 | ..... | " ..... | Has been heated at middle. |
| 4701. | H. D. | " .. | 13. | 1.02 × .40 = .408 | 1.02 × .40 = .408 | 20,100 | 49,260 | At weld..... | " ..... | ..... |
| 4702. | H. D. | " .. | 12.8 | 1.02 × .40 = .408 | 1.02 × .40 = .408 | 21,020 | 51,520 | " ..... | " ..... | ..... |
| 4703. | H. C. | " .. | 12.8 | 1.17 × .48 = .562 | 1.02 × .40 = .408 | 21,820 | 53,480 | 3 in. from weld.. | " ..... | ..... |
| 4704. | H. C. | " .. | 12.9 | 1.14 × .45 = .513 | 1.02 × .40 = .408 | 21,810 | 53,480 | At weld..... | Dull fibrous, in part gr..... | ..... |
| 4705. | H. H. | " .. | 12.9 | 1.13 × .49 = .513 | 1.02 × .40 = .408 | 20,400 | 50,000 | " ..... | Dull fibrous and spongy. | 12,000 lbs. comp. acid'tly applied before tension test. |
| 4722. | ..... | Octagonal steel. | 16. | Not welded..... | .66 diam. = .360 | 45,800 | 127,220 | ..... | Fine gr. radiating from a spot at circumfer.. | ..... |
| 4723. | ..... | " " | 16. | " ..... | .66 " .360 | 45,670 | 126,860 | At face of grips... | Fine gr. radiating from a spot at circumfer.. | ..... |
| 4724. | ..... | " " | 15.75 | .66 diam. = .360 | .66 " .360 | 27,500 | 76,390 | At weld..... | Coarse gr..... | ..... |
| 4725. | ..... | " " | 16. | .67 " .372 | .66 " .360 | 22,900 | 63,610 | " ..... | Coarse gr. yellow cast at circumference.... | ..... |
| 4726. | ..... | " " | 16. | .80 " .531 | .66 " .360 | 32,550 | 90,420 | At end of enlarg. section of weld. | Coarse gr..... | ..... |
| 4727. | ..... | " " | 16. | .78 " .502 | .66 " .360 | 37,800 | 105,000 | At end of enlarg. section of weld. | " " ..... | ..... |
| 4728. | ..... | Oct'nal steel & wrought iron | 16. | .65 diam. = .332 iron... | .63 " .328 | 17,100 | 52,130 | In iron, 3 inches from weld..... | Fibrous..... | ..... |
| 4729. | ..... | Oct'nal steel & wrought iron | 16. | .75 diam. = .442 iron... | .63 " .328 | 17,070 | 52,040 | In iron, 2.3 in. from weld ..... | " seamy.. | ..... |
| 4730. | ..... | Oct'nal steel & wrought iron | 16. | .77 diam. = .466 iron... | .63 " .328 | 16,950 | 51,680 | In iron, 2.8 in. from weld ..... | " ..... | ..... |
| 4731. | ..... | Copper..... | 12. | Not welded..... | .373 " .109 | 3,580 | 32,840 | ..... | ..... | ..... |
| 4732. | ..... | " ..... | 12. | " ..... | .373 " .109 | 3,540 | 32,480 | ..... | ..... | ..... |
| 4733. | ..... | " ..... | 12. | " ..... | .373 " .109 | 3,530 | 32,390 | ..... | ..... | ..... |
| 4734. | D. | " ..... | 11.75 | .380 diam. = .113 | .373 " .109 | 3,210 | 29,450 | At weld ..... | ..... | ..... |
| 4735. | D. | " ..... | 11.80 | .380 " .113 | .373 " .109 | 3,390 | 31,100 | " ..... | ..... | ..... |
| 4740. | ..... | Brass..... | 12. | Not welded..... | .374 " .110 | 5,240 | 47,640 | ..... | ..... | Has been heated at middle. |
| 4741. | ..... | " ..... | 12. | " ..... | .374 " .110 | 5,275 | 47,950 | ..... | ..... | Have been heated at middle. |
| 4742. | ..... | " ..... | 12. | " ..... | .374 " .110 | 5,240 | 47,640 | ..... | ..... | |
| 4743. | D. | " ..... | 11.8 | .375 diam. = .110 | .374 " .110 | 4,490 | 40,820 | At weld..... | ..... | ..... |
| 4744. | D. | " ..... | 11.8 | .375 " .110 | .374 " .110 | 5,250 | 47,730 | ¾ inch from weld. | ..... | ..... |
| 4747. | ..... | Brass & wrt. ir.. | 10.3 | .374 " brass | .374 " .110 | 1,920 | 17,450 | At weld..... | ..... | ..... |
| 4748. | ..... | " " .. | 11.5 | .374 " brass | .374 " .110 | 3,690 | 33,550 | " ..... | ..... | ..... |
| 4749. | ..... | Steel & German silver.. | 9.15 | .33 " .086 | .250 " .049 | 1,980 | 40,410 | " ..... | ..... | ..... |

4753. A chain made of three links of .59 in. diam. wire. Two welds in each link at the sides. Tensile strength, 17,900 lbs. Fractured middle link in the quarter 1.60 in. from weld. Appearance fibrous.

joining the tool steel edge to a mild steel poll, bars are heated in the middle and upset, forming collars; and pipes are joined together—a matter of great value in ice machines. The list might be continued to greater length, but this indicates the range of its practical uses at this early day.

The value of the process, for most purposes, independent from any scientific interest or mechanical ingenuity shown in the apparatus, must be that of the resistance of the welds under tensile stress. It will be readily understood, however, that, as this process accomplishes many things hitherto impossible, aside from any question of ultimate strength, it is fitted for applications in many constructions where it saves labor and time; provided only that the joints be in all cases sufficiently good for the purpose for which the article is designed. A large field thus opens up in the execution of ornamental design in metal work, where it will supplant screws, rivets or solder for fastenings, and in other evident applications.

There is no reason why such a weld should be stronger than the rest of the bar, but if averaging of equal strength some of the breaks would occur at the weld. There have been many tests made on various testing machines, but we give on page 290 part of the official record of tests made on the Emery testing machine at the United States Arsenal at Watertown, Mass.



FIGS. 1 AND 2.—INCANDESCENT LAMP REFLECTORS AND SHADES.

## Improved Electric Light Reflectors.

Our attention has recently been called to some new productions of the Wheeler Reflector Company, of Boston, Chicago and Philadelphia, which comprise several features of interest to electric light companies. First, the large, overhead reflectors for churches and halls, shown in the plainest style in the accompanying cut, Fig. 1. These are lined with mirror-plate glass, are exceedingly attractive in appearance, of great power, and do not deteriorate. With these shades, any style of accessory ornamentation may be introduced, so that beauty, desirable in the fittings of large edifices, is not sacrificed to utility. We note also incandescent shades, "style 301," with glossy white enamel surface, in all sizes, seamless, from 8 to 18 inches in diameter, Fig. 2. These are a decided improvement on the common painted shades in the market, and yet are of lower cost. We can imagine no better assistance in introducing the incandescent light than such appliance, adding to its beauty and efficiency.

## The Hazelton Stationary Boiler for Electric Stations.

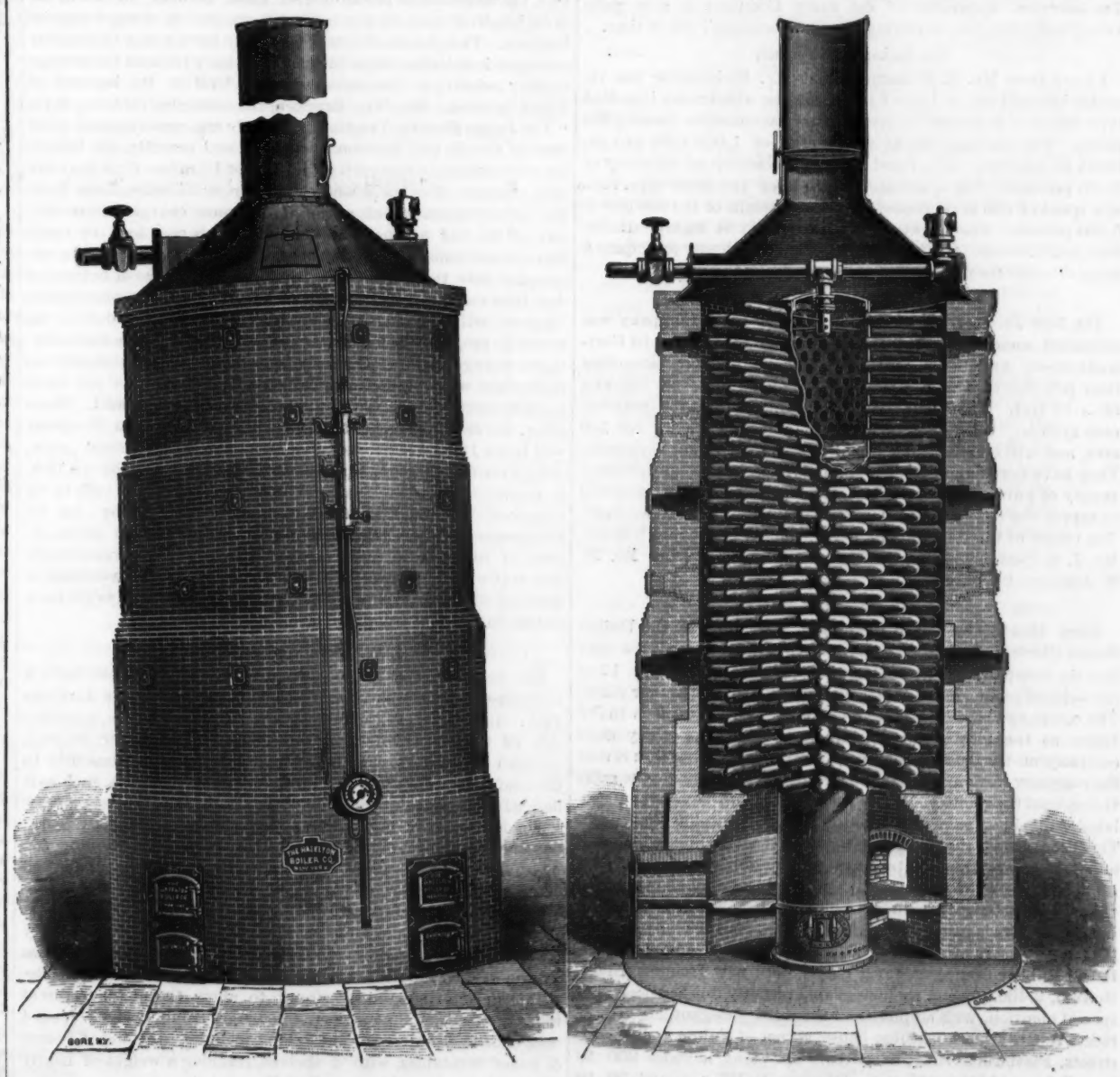
Steam generation plays such an important part in the production of electric light and power currents, that any advance in this direction seems worthy of notice. Thus we have recently had called to our attention the introduction, into several electric light stations, of the new Hazelton boiler. This boiler, shown in external and sectional views in the accompanying engravings, is of the water tube type. As will be seen, it consists of a central stand pipe which rests upon a circular cast-iron foundation plate, placed upon a supplementary foundation of brick, raised one course above the level of the foundation, so as to prevent water in the ash pit from coming in contact with the boiler. It is not fastened to the foundation, and can thus expand and contract freely.

That portion of the stand pipe below the grate bars forms the mud drum, into which a manhole with plate is placed, affording ready facility for entering the boiler and examining every portion of its interior surface. Owing to the very rapid circulation of water in the boiler, the extraneous matter contained in the water is deposited in the lower end of the stand pipe and either blown off or removed through the manhole.

The standpipe is provided with radial tubes open at their inner ends and expanded into the standpipe. The outer ends of the tubes are closed and extend to within one inch of the inner surface of the brickwork enclosure. Thus the radial tubes being secured at one end only, and clear of the brickwork at the other end, can expand and contract without strain.

Provision has also been made for drying the steam. As will be seen, a wrought iron flange is riveted to the under side of the top head of the stand pipe, and abundant thread hold secured by cutting a thread through both head and flange. A nipple is screwed in from the outside, the lower end with a long thread extending below the head two or three inches. At the upper end of this nipple a malleable iron tee is connected, and from one outlet of this tee the steam pipe extends horizontally to the outer line of the brickwork to receive the steam valve, and in a like manner another pipe in the opposite direction connects with the pop safety valve.

At the lower end of the nipple, and inside of the stand pipe connected to it by a pair of flanges bolted together, is a vertical pipe, open at the upper end and closed at the lower end. Into this vertical pipe are screwed a series of horizontal wrought iron pipes, of small diameter, and open at both ends, which extend outward and into the uppermost steam drying tubes in the stand pipe, almost to their outer ends, and the steam as it becomes disengaged from the surface of the water must enter the steam drying tubes, pass to their outer ends, before entering these small pipes, which convey the dry steam into the steam pipe. Owing to the height of the boiler itself only a very short iron stack is required, so that the expense of a brick chimney is avoided.



FIGS. 1 AND 2.—THE HAZELTON UPRIGHT BOILER.

Our illustrations represent a 215 h. p. boiler such as has been recently installed by the New Britain, Conn., Schuyler Electric Light Company. The United Electric Light Company, of Springfield, Mass., has also installed three of these boilers of 215 h. p. The Meriden, Conn., Electric Light Company, as well as the Excelsior Electric Company, of Orange, N. J., have each a Hazelton boiler of 150 h. p., all built by the Hazelton Boiler Company, of New York.

## The Action of Electricity on the Vesicles of Condensed Water.

In the *Archives des Sciences Physiques et Naturelles* M. J. L. Soret recently described the following interesting experiment: In a dark room a platinum cup containing water is placed on a metal support, which is connected with one pole of a Töpler machine. Above this cup a metal point is placed, which is connected to the other pole of the machine. A Bunsen burner boils the water in the cup, which is powerfully illuminated by the projection of a large pencil of the electric light. As long as the Töpler machine is at rest the vapor vesicles ascend in the ordinary way; but as soon as the machine is at work the action of electricity on the vapor is manifested in a most striking manner. For a certain distance from the point to the surface of the water the clouds collect and whirl along the edge of the cup; under the influence of the electric light they look to a certain extent like flames. If the point is brought a little nearer the water the vapor disappears completely although the water commences to boil briskly.

## Electrical Elevators for the Eiffel Tower.

Two elevators are suspended at the two ends of eight steel cables passing over a pulley, and move up and down in two cylindrical adjacent cages, being kept vertical by the aid of guides. Each lift is divided into three compartments, one over the other. The two upper compartments are designed to hold one hundred passengers; and [the lower compartment contains a motor of 25 to 30 h. p., to which the electricity is conveyed by a wire from generators on the ground. The motor gives a rotating motion to a truck connected axially with the bottom of the lift, which rolls, by means of four projecting wheels placed radially, along a helicoidal rail winding round the side of the cage. There are two of these helicoidal rails placed slightly further apart than the diameter of the wheels, so that the wheels roll on the top of the lower one when the lift is descending, and revolve on the bottom of the upper one during its ascent. The suspending cables are exactly counterpoised by similar cables, attached to the bottom of both trucks, and rolling round two pulleys below the base of the cages. It is assumed that in practice the utmost difference between the load of the two lifts will be fifty passengers, or a weight of 3½ tons, whereas the resistance of the system to motion is calculated at 4 tons, so that the lifts will not be liable to move of themselves; and though the machines are furnished with a brake, the stopping of the motors will stop the lifts. The descending truck, revolving under the action of its motor, will draw down its lift, and draw up the other lift, which will be lightened by the action of the motor in the truck below

it. For a speed of 1½ foot per second, the power required when the lifts are equally loaded will be 27 horse-power; when the descending lift has the maximum excess of fifty passengers it will be 5 horse-power, and in the reverse case 48 horse-power. Under the ordinary conditions of traction there will always be a space between the lift and its revolving truck; but if the cable broke, the lift falling freely on the connecting axle would overtake the revolving truck, and thereby arrest its rotation and prevent any further movement, thus securing the safety of the lift in the event of a fracture. A telephone will place the two men working the lifts in communication, so that they can always work in concert. The lift is to take passengers from the second to the third floor of the tower, a vertical height of 492 feet, without a stoppage, in about five minutes.

# Special Correspondence.

## NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
168-177 POTTER BUILDING, NEW YORK, Nov. 26, 1888.

### Engine and Steam Plant.

Mr. H. C. White, 16 Dey street, representing the Phœnix Iron Works, of Meadsville, Pa., has sold a 65 h. p. Dick & Church automatic cut-off engine, and two 70 h. p. boilers to the Edison Electric Light Company, of Dover, N. J. He has also sold 100 h. p. of boilers to the Edison United Manufacturing Company, for Burlington, N. J.

### Some New Edison Plants.

Mr. F. R. Chinnock, Edison agent, reports having closed the following contracts for plants: Ten in New Jersey and Pennsylvania, each to have a capacity of 75 lamps; Joseph Wilde & Co., Astoria Carpet Mills, 100 lights; Borne, Scrymser & Co., Oil Works, L. I., 100 lights; Astoria Silk Mills, 300 lights; L. Waterbury & Co., Rope Works, 300 lights.

### Lighting New York Ferry Boats.

The United States Company has now plants on no fewer than four of the Brooklyn & New York Ferry Company's boats. The last of these plants is on the "Maine," and has now been working very satisfactorily for several weeks. These plants are in charge of Mr. H. Ockershausen, who also superintended the installations. The electrical apparatus of the Ferry Company is now quite varied and extensive, requiring Mr. Ockershausen's whole time.

### The Eickemeyer Dynamo.

I learn from Mr. J. H. Bunnell that Mr. Eickemeyer has recently brought out a large dynamo of the well-known iron-clad type, which is to be used in accumulator factories for forming the plates. The machine runs at a potential of 1,000 volts and delivers 40 ampères. It is rated at a net commercial efficiency of 95.05 per cent. The armature, which is of the drum type, runs at a speed of 850 revolutions. The total weight of the machine is 6,000 pounds. The operation of the dynamo is highly satisfactory, and Messrs. J. H. Bunnell & Co. confidently anticipate a large demand for machines of this iron-clad type.

### Electric Lighting in New Jersey.

The New Jersey & Perth Amboy Electric Light Company was organized some months ago by Seabury & Johnson, of 18 Cortlandt street, and other gentlemen. They are now constructing their pole line at Perth Amboy, and putting up a new building 35 × 75 feet. They will install both the arc and the incandescent system. They are now prepared to install capacity for 150 arcs, and will soon be ready to put in the incandescent apparatus. They have bored an artesian well, and have found an unlimited supply of pure water to such an extent that they have proposed to supply the city of Perth Amboy with water as well as light. The offices of the company, at Perth Amboy, are 48 Smith street. Mr. J. M. Seabury is the president of the company, and Mr. H. H. Johnson, treasurer.

### United States Plants.

Some idea of the large amount of work done by the United States Electric Lighting Company may be formed from the fact that the company has over 34,000 incandescent lights in 12 of its isolated plants, or an average of nearly 3,000 lights per plant. The company claim that these plants aggregate about as many lights as the total isolated incandescent business of any other company in the field, except one. Another interesting fact is that the company have more than 30,000 lights in use in textile mills throughout the country. At the present time they have over 40 isolated plants in construction, ranging from 150 to 2,400 lamps each. This list includes the magnificent new *Times* building, which will take 1,100 lamps; and the beautiful new building which the *Judge* is putting up on Fifth Avenue. Among others may be mentioned the Williamsburg Brewing Company, Brooklyn, E. D., 150 lamps; S. Loeb's new building, 18th street and Broadway, 400 lamps; McNeely Company, Philadelphia, 600 lamps; Brookhaven Rubber Company, Long Island, 450; new Iroquois Hotel, Buffalo, 2,400. One of the new plants recently finished deserving special mention, with emphasis on the word "elegant," is that of Smith & Gray's new clothing house, corner of Fulton and Nevins streets, Flatbush avenue, Brooklyn. The plant includes 200 16 c. p. lights and 80 of 125 c. p. Of these, 40 125 c. p. and 50 16 c. p. are used on the main floor or salesroom, where a most beautiful and brilliant effect is obtained.

### Subway Work.

The Board of Electrical Control met at its office on Nov. 23. Assemblyman O'Connor, the representative of the Electric Power Company, of New York, made a statement to the board, in which he vindicated his bona fides in the matter of an assertion made by him at the meeting of the board on the 30th ult., that the consent of the United States Illuminating Company to use its poles had been given to the company he represented. To a letter of C. D. Donnell, of the Department of the Inspection of Buildings, Boston, in which it was stated that that city had undertaken the consideration of the underground wire question, and asked the board for information on the subject, the secretary was directed to reply, and to inclose a copy of the report made to the board, and also a copy of the new rules and regulations. The application of Mr. D. Morgan Hildreth, who represented the Johnstone Underground Electric Light and Power Company, for permission to lay down pipes in the city streets, was referred to a committee, which should make inquiry as to the character of the company, and report thereon to the board at its next meeting. Applications for permits under the new rules and regulations, and other communications, were received from the Metropolitan Telephone and Telegraph Company, the Western Union Company, the Manhattan Electric Light Company, the United States Illuminating Company, the Brush Electric Company and the Commercial Telegram Company.

### The Callender Company.

A neat little pamphlet has just been issued by the Callender Insulating and Waterproofing Company, intended to bring before the public the merits of their system of continuous feeders for underground service, the relative cost of such a system as compared with systems of sectional feeders, and a variety of other information bearing upon underground work in general. The pamphlet includes a number of practical examples in the shape of reports from a number of Edison stations where the Callender underground work appears to have been in very satisfactory use. The cables which the company manufacture, it may be mentioned, consist of stranded copper conductor, in which the number of strands is in proportion to the size of the conductor, in order to give the flexibility necessary for easy handling, both during manufacture and while undergoing the process of laying in the streets. The conductor is covered with a special preparation of bitite, which is produced from pure natural bitumen, whose qualities it combines with those of rubber. As bitumen is neither vegetable nor fibrous in its nature it has many points of advantage. After the conductor has been covered with bitite, the cable receives three strong linen tapes, saturated in bitumen, and also a braid, which is either saturated in the bitumen compound or painted for inside work. Between the tapes and the braid the cable receives a thorough saturation in the bitumenous compound, so that, when finished, the bitite insulation is thoroughly protected from rough usage. The company state, with regard to their underground work, that they manufacture their heavy feeders for laying in lengths varying from 800 to 1,200 feet.

### Work of the Julien Company.

The Julien Electric Company are making largely increased sales of their storage battery. From Nov. 1 to the 16th, eleven installations have been sold, amounting in all to 1,540 accumulators, the largest sales probably ever made here or abroad in the same length of time by any company engaged in storage battery business. The Julien Electric Company have now a thoroughly equipped installation department. They have reduced the storage battery industry to the same practical level as the business of direct lighting. Mr. Wm. Bracken, the managing director, says: "The Julien Electric Traction Company are now running three cars on Fourth and Madison avenue. Until recently, the batteries were changed after each round trip of 12 miles. Now they are only changed after the second round trip, or 24 miles. Even then, the battery requires but about three hours charge before it is put on the car again. The company hopes very soon to make three round trips, or 36-miles, with one charge. If they can accomplish this there will be required but one charge of battery a day, thus making a great saving of time and labor. In other words, "horses" will be changed but once a day. All this is due to the scientific progress the Julien Company is making, more especially in the storage battery. The company has done a great deal of experimental work on the three cars now in use, and has put them to such practical tests as to be able to settle on a standard. Hereafter, the standard car of the Julien Electric Traction Company will be an 18-foot body, mounted on an independent rigid ruck, with a six-foot wheel base and (on the Fourth avenue line) a 15 h. p. motor geared to each axle. The car will carry 144 cells in six groups of 24 each. This novel grouping is for economy; for by this means the motors will be run most of the time in series, instead of together in parallel, as at present. It is a remarkable fact that none of the Julien cars have yet broken down or become disabled since they were put in service, but have always got back to the station without any external aid."

### A Few More Institute Notes.

The Economic Gas Engine Company, of 34 Dey street, have a new type of gas engine on exhibition at the American Institute Fair. In this engine 2 cylinders are used at an incline, on either side of the central driving shaft. Explosions occur in each cylinder alternately, communicating the power continuously to the shaft, and affording, it is said, very steady motion, such as is desired in electric light plants.

The Riker Motor Company, of 132 Reade street, New York, have a neat exhibit of ⅙, ⅓ and 1 h. p. motors, running job printing press, sewing machine and pump, power being derived from 5 Roberts-Brevoort primary batteries.

A very handsome and interesting light exhibit is that made in the space of the Eclipse Electric Company, and the Empire City Company; it is composed of a fine Jacot music box which is run by one of Mr. Hussey's electric motors lately constructed. Resistance is interposed in the circuit to allow the motor to run at three speeds, by a 3-point switch, current being derived from 4 cells of Hussey battery. The exhibit includes, also, one of Pearce & Jones' turntables, with 4 shelves, reaching a weight of nearly 75 pounds, and run by one cell of Hussey battery.

The D. Frisbie Company, of 112 Liberty street, have a complete elevator plant, run by Sprague motor.

A. C. Manning & Company, 18 Vesey street, exhibit a full line of Otto gas engines in operation. Their latest advance is a 20 h. p. gas engine, which runs with the utmost smoothness and ease. The sizes of Otto gas engines now range from 1 to 100 h. p.

The Beck Automatic 25 h. p. steam engine, which runs the United States Electric Lighting Company's exhibit, showed while I was up at the fair the other night how it could carry heavy loads, and instantaneously adjust itself to new requirements. In this instance it took up satisfactory a heavy additional load. The engine was carrying nearly 240 16 c. p. lamps when they switched in 110 more all at once. The engine was also running the generator to supply current to the Sprague motor for the Frisbie exhibit.

W. T. H.

## NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
178 Devonshire Street, Boston, Nov. 26, 1888.

### Personals.

Mr. A. S. Beves, Treasurer of the Sprague Electric Railway and Motor Company, of New York, was in this city last week.

Mr. David Chalmers, of the Empire City Electric Company, of New York, favored this office with a visit on Friday of last week.

### Woburn, Mass.

The Woburn Electric Light Company are now at work putting up a trunk line to Lexington, having awarded contract to Messrs. Kendall & Slade, of this city, for the construction work. This line will complete the circuits covering the operations of the company, which comprise lighting in Woburn, Winchester, Stoneham and Lexington.

### Lecture on Electricity.

Mr. Leonidas Le Cenci Hamilton, M.A., auther of the book entitled "Origin of Energy," will deliver a popular science lecture at Horticultural Hall, Boston, on Friday evening, November 30. Subject: Electricity and Magnetism; what they are, and where they come from. Lecture will be illustrated by experiments.

### Edison Isolated Plants.

Messrs. Paine & Francis, the New England agents of the Edison United Manufacturing Company, have made several large isolated plant installations since Sept. 1, among which are the following: 225 lights for Messrs. Snow, Bassett & Co., Franklin, Mass; 375 lights for the Pearson Cordage Company, Boston; 500 lights for the Marlboro, Mass., Schuyler Electric Light Company; 450 for the Continental Clothing House, Boston, Mass.

### The Thomson-Houston System.

Mr. Styles, one of the selling agents of the Thomson-Houston Electric Company, has just erected a commodious brick building at Plymouth, Mass., and he is now at work looking after the installation of the electric lighting apparatus and the equipment of the steam plant. The lighting capacity to commence with will be 10 arcs and 500 incandescents.

The Thomson-Houston Electric Company reports the following new business: Chattanooga, Tenn., 200 arcs; Findlay, O., 185 arcs; Wood, Brown & Co., Philadelphia, Pa., 60 arcs; Young, Smith & Co., Philadelphia, Pa., 60 arcs; Ensley, Ala., 35 arcs; and the following increases: Johnstown, N. Y., 50 arcs; Salem, Mass., 25 arcs; Columbus, O., 100 arcs; Worcester, Mass., 35 arcs; Portland, Me., 35 arcs, 800 incandescents; East River Company, New York City, 100 arcs, 1,000 incandescents; Toledo, Ohio, 100 arcs; Mobile, Ala., 85 arcs; Nashua, N. H., 45 arcs; Oneida, N. Y., 35 arcs; Waltham, Mass., 50 arcs; Cambridge, Mass., 45 arcs; Columbia, S. C., 30 arcs; Atlanta, Ga., 50 arcs; Hyde Park, Mass., 50 arcs; Buffalo, N. Y., 800 incandescent; Stamford, Conn., 30 arcs; Rome, N. Y., 50 arcs; Somerville, Mass., 50 arcs; Waterville, Conn., 500 incandescent; Malden, Mass., 500 incandescent.

### Electric Lights and Electric Road at Leominster.

Leominster, Mass., is likely to have both electric lights and an electric railway. A local company for the supply of the first was organized in June last, but failed to accomplish material results until lately, when the concern was reorganized. The central station is to be located on land of Valpey & Anthony, where a building 30 × 50 feet, with a boiler house 25 × 40 feet, will be erected. The foundation for it is begun, and a 90 horse-power boiler already ordered. Leominster is a good field for electric lighting operations, as the village is compact, gas is very high and of a poor quality, and the people are tired of it. Probably the Thomson-Houston system will be introduced. As regards the electric railway project, it is proposed to have a line five miles in length to extend from Leominster Centre, through North Leominster to Fitchburg, connecting there with the street railway of that city. It is understood that sixteen persons, representing Leominster, Boston and Lynn have subscribed for two hundred shares in the contemplated railway, with a capital stock of $20,000; par value of shares, $100. Of these 200 shares, 191 are held by members of the Thomson-Houston Electric Company and those directly or indirectly interested in that company. Predictions as to what system will be used would be superfluous. This method of organization certainly possesses the merit of novelty, at least, and shows the strong faith of the members and staff of the company in their system.

### The West End Electric Road.

From the Boston *Daily Globe* of Nov. 23 I clip the following interesting item: The West End Electric Railway is fast approaching a state of completion, and there seems now little doubt but what the cars will be running by the first of the month, although perhaps not for passengers. A visit to the power-house at Allston yesterday found one of the engines in position and running. There are to be two Armington & Sims engines of 200 horse-power each, and they will each run two Edison dynamos, the fly-wheels making 200 revolutions a minute. The car house is not yet roofed in. The wires for the current are laid to the power house and will be tested to-day. All the poles are up and the span wires are in place from Wilton street, Brighton, to Ipswich street, Boston. These wires will stand a pressure of 1,400 pounds. The trolley wire is laid from Wilton street to the Hawthorne turnout on Harvard avenue. The longest span known in the construction of any electric railway in the world is that which crosses Massachusetts avenue at Harvard avenue, which is 260 feet long. Each car will have two 7½ horse-power motors, making a total power of 15 horse-power, and these motors are hung on the axles. There will be three cleaning cars equipped with two motors of 12½ horse-power each, and these will also be used for snow-plows. The conduit is laid from Ipswich street down Boylston street as far as Berkeley street. Instead of having two conduits, one between each rail, as is usually the custom, the West End are laying their conduit in the centre between the two tracks, and this only necessitates one conduit. The slots are about 10 inches from the rails, and the entire track is of Richards & Longstreet's girder rail.

### New Electric Light Station at Cambridge.

The Cambridge Electric Light Company's new lighting station, corner Albro street and Western avenue, Cambridge, Mass., was

formally opened yesterday afternoon by an inspection of the premises by nearly 150 prominent citizens, including many members of the city government. An excellent dinner was served in the large room on the second floor. President Josiah Q. Bennett, of the company, presided, and Hon. L. M. Hannum officiated as toastmaster. Speeches were made by Hon. Robert O. Fuller, Gen. E. W. Hincks, President Henry M. Whitney, of the West End Street Railway Company, Hon. Chester W. Kingsley, Hon. Henry O. Houghton, Mr. Charles Bullock, Mr. Edgar R. Champlin, General Manager F. H. Raymond of the company, ex-Alderman F. H. Holton, Alderman Frank H. Teele, Mr. W. A. Boland of the Thomson-Houston electric company, and Mr. Warren F. Spalding, editor of the Cambridge *Daily*. Music was furnished by a male quartet, composed of Messrs. F. L. Pratt, George Munroe, B. O. Danforth and H. S. Andros. Among the electrical guests present were: E. I. Garfield, H. C. Patterson, H. M. Batcheler, W. F. Pope, J. S. Felton, Charles Davis, and W. B. Hosmer. THE ELECTRICAL WORLD representative was also present. Previous to the dinner the guests were escorted about the station by the superintendent Mr. W. R. Eaton. The building is 147 feet long and 60 feet wide. Over the dynamo room the building has a second story which is used for sleeping rooms for the superintendent and those of the employés who remain all night at the station; the offices of the treasurer and superintendent, and toilet, storage and work rooms. Every precaution was taken with this feature of construction. The materials and equipments of the building are most superior and chosen with a view to durability. The furnishings of the offices are costly and beautiful. In fact, everything has been done to make it one of the finest electric lighting stations in the country and to answer all the requirements of the city for years to come. In the rear, bordering on the Charles River, is a large wharf for the landing of coal and materials. The boiler-room of the station is one of the largest and most neatly fitted up departments of the kind in the country. At present only four boilers of an aggregate of 500 h. p. are in position. Sufficient room is left for double this number. The boilers were manufactured by Edward Kendall & Sons, Cambridgeport, Mass., and are set with the Jarvis patent furnace and Sheffield grate bar for burning cheap fuel. The Jarvis Engineering Company equipped the entire steam plant; and this company deserves the highest encomiums for its painstaking and careful work in this installation, which includes a 1,000 h. p. condenser of the Worthington type; one National feed water heater of 500 h. p.; one Davidson feed pump; one Worthington Duplex pump; and a small supplementary heater for heating the water after leaving the large feed-water heater. Just at the rear of the boiler room is a large wharf and occupying the greater part of it is a coal-shed capable of containing 10,000 tons of coal. In the dynamo and engine department are the following machines and apparatus: a large "Buckeye" double engine of 250 h. p.; one N. Y. Safety Steam Power engine of 80 h. p.; two Armington & Sims of 60 and 90 horse-power, respectively; a long line of shafting fitted up with Hill clutches; two 45 arc machines for commercial lighting to midnight; one 45 arc machine for commercial lighting all night, most of which are in use at Squire's pork packing establishment; two 50 arc lighters for street lighting (all night); one 1,000 light alternating dynamo for commercial and street lighting; one generator for electric motor purposes; and one spare 45 arc-light machine. In addition to the above is another Armington & Sims engine belted on to a 500-light alternating machine to be almost exclusively used for illuminating the Riverside Press building, owned by Messrs. Houghton, Mifflin & Co., the world-renowned publishers.

The magnificent piece of workmanship shown in the immense line of substantial shafting and clutches—by which a load at a moment's notice may be thrown on or off the large Buckeye engines—is the handiwork of Mr. Geo. S. Davis, of Nashua, N. H. The arrangements of the engines and dynamos are such as to admit of putting in double the number of each at any time. The foundations are substantial, being from 10 to 12 feet deep, and constructed of the best rock, brick and cement. The lofty smoke stack is fully 150 feet high, is octagonal in shape and built of the finest pressed brick and other material. In preparing the plans and during the erection of the building Mr. H. C. Patterson took especial pride in seeing that this smoke stack would be one of the finest of the kind in the New England States. His efforts have been successful.

Under the flagged floor of the engine room is an enormous cistern, with a holding capacity of one million gallons. Through the centre of this cistern is a wall made of soft brick through which the water filters.

Among the other apparatus forming a part of the station's equipment are the following: Two 6-circuit feeder boards, 12 circuit switch-boards for arc lighting, and the alternating switch-board, which contains 2 potential indicators, 4 current indicators, 2 double-pole transformers and a number of minor switches. An enormous quantity of "Clark" wire is used in and about this station, and lighting arresters are attached at all necessary points along these wires.

The station has a private fire-alarm box, the latest pattern of the Gamewell Company, by which, if necessary, an alarm can be rung in at the fire department. The fire protective arrangements of the station are perfect. Lines of hose are rolled up and conveniently within reach in dynamo room and on the upper floor respectively. These are connected with the pumps in the boiler room, and the latter direct with the city supply of water.

Mr. H. C. Patterson, the electrical and mechanical engineer of the Thomson-Houston Electric Company, is the gentleman who planned and superintended the erection of this model station. It is to him that the Cambridge Electric Light Company are indebted for the largest and most completely equipped station in New England.

W. I. B.

## PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
39 South Tenth Street, Philadelphia, Pa., Nov. 26, 1888.

### Subway Legislation.

The amended bill granting underground privileges to the Keystone Light and Power Company was before a sub-committee of the Committee on Electrical Bureau this week and favorably acted upon.

### New Companies.

Among the companies chartered at the State Department during the past week were the Commonwealth Telegraph Company, of Pittsburgh, capital $1,000. The line is to be constructed within the county of Allegheny. Also the Beaver Valley Electric Light and Power Company, of Beaver Falls, capital $12,000.

### Telephone Conduits.

While the cold weather of the latter part of last week put a stop to nearly all street work, it did not hinder those engaged in the underground electrical work from pushing their conduits ahead. The Bell Telephone Company are building very extensively in this line, and they as well as all the underground companies are making rapid progress.

### Oil Cups.

J. E. Lonergan & Co., the well-known oil cup men, of this city, are doing a large amount of work in the way of pop safety valves for boilers for high speed engines, and oil cups for dynamos and engines running electric light plants. This firm is one of the old Philadelphia landmarks, and their success in other lines of steam engineering soon brought them a reputation in the electrical field.

### Franklin Institute.

The Franklin Institute has received an additional contribution of $5,000 from Mrs. Bloomfield Moore, to the "Bloomfield Moore Trust Fund," for the endowment of the library.

At the regular weekly meeting of the Institute last week the plans for the proposed new building, to cost $500,000, were shown. They represent a handsome three-story building with commodious lecture rooms and library.

### Boiler Compounds.

The Imperial Chemical Company, of No. 324 St. John street, of which Mr. A. Wasserman is the manager, are doing a large and profitable business in manufacturing boiler compounds. Each compound manufactured by the company is adapted to the particular occasion for which it is required, as they secure a sample of the scale and water used, and analyze each before preparing a preventative compound. Thus they are enabled to successfully cope with the dreaded scale and other injurious substances so well known to steam users. Their order book contains the names of nearly all the prominent steam users in the country, including a large number of electric light plants.

### The Keely Motor.

The ruling sensation in the city during the past week has been the imprisonment and subsequent release by writ of habeas corpus of inventor John W. Keely, whose motor has achieved a worldwide notoriety by reason of its having failed, up to the present writing at least, to "mote." Mr. Keely was brought into court on Saturday the 17th inst. on a writ of attachment for contempt, for having failed to obey an order of the court to explain the modus operandi of his mysterious machine to a commission of experts appointed by the court to determine whether his present apparatus was not the same in construction as the one which he transferred to Bennett C. Wilson in 1869. A wrangle among the experts caused the case to be brought into court for a second time, and upon the strength of the assertion of a majority of the Commission that Keely had not given a satisfactory exhibition of his machine, Judge Finletter committed him to Moyamensing prison until such time as he should purge himself of contempt. He remained in prison from Saturday until Tuesday afternoon, when the Supreme Court came to his relief by granting the writ of habeas corpus asked for by his attorneys. Mr. Keely now promises to have his motor "moting" within four months, just to spite what he terms his "persecutors." His case will come before the Supreme Court, Jan. 12 next.

E. W. E.

## WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
44 Lakeside Building, Chicago, Nov. 24, 1888.

### Racine, Wis.

The Badger Illuminating Company, of Racine, are adding 20 Thomson-Houston arc lamps to their plant.

### Findlay, Ohio.

Mr. B. P. Foster, of this city, is increasing his plant by the addition of 35 lamps, Thomson-Houston system.

### Canton, Ill.

The People's Gas and Electric Light Co. are increasing their plant by the addition of 20 Thomson-Houston arc lights.

### Eureka, Cal.

The Dolbeer-Carson Lumber Co., of Eureka, Cal., are putting in a plant of 20 arc lights, Thomson-Houston system.

### Columbus, Ohio.

The Columbus Electric Light and Power Co. are increasing their plant with 100 arc lamps of the Thomson-Houston system.

### Battle Creek, Mich.

Mr. W. A. Foote, of this city, has ordered, through the Western Department of the Thomson-Houston Company, an increase of 35 arc lights.

### Rockford, Ill.

Mr. J. H. Shay, of the C. Munson Belting Company, informs me that he has just sold one 30-inch and one 38 inch main belt, and 200 feet of 10-inch belting to the Rockford Edison Company.

### Aurora, Ill.

The Secretary of State issued incorporation license this week to the Consolidated Electric Light and Power Company, Aurora; capital stock, $50,000; incorporators, Ira B. Copley, Howard Knowles and I. C. Copley.

### Honors for the Baragwanath Heater.

At the Cincinnati Centennial Exposition, just closed, the silver medal for the best feed-water heater and lime extractor was awarded to Wm. Baragwanath & Son, manufacturers of the well-known steam jacket feed-water boiler and purifier.

### A "Telephone Organ" Company.

The Secretary of State at Springfield, on Nov. 19, issued incorporation license to the Reynolds Telephone Organ and Piano Company, at Chicago; capital stock, $500,000; incorporators, Andrew Jackson Reynolds, William L. Moss, Charles W. Needham, Kendall Hurt, and John Johnston.

### A Russian Patent.

I was recently shown by Mr. Forée Bain a patent issued him for a dynamo by the Russian government. It is a queer looking document and its size is something remarkable, being 22 by 32 inches, and consisting of two sheets. The patent holds good for ten years, and was received by Mr. Bain a short time ago.

### The Thomson-Houston Company.

Among recent orders for electric lighting apparatus the Western Department of the Thomson-Houston Company report the following: A 12 arc light plant for Hastings, Mo.; also a 150 incandescent light plant for lighting the shops and factory of the Eclipse Wind Engine Company, at Beloit, Wis., manufacturers of the Eclipse friction clutch pulley.

### Lighting a Steamboat by Electricity.

The San Joaquin Improvement Company, of Stockton, Cal., are building a large and handsome steamer for use along the Pacific coast. It is to be lighted throughout by electricity, the company having ordered, through the Western department of the Thomson-Houston Company, the necessary lights, including search lights, etc. The incandescent system will be used exclusively.

### A Theatre Installation.

The formal opening of Baker's Theatre occurred Monday night. It is a first-class theatre in every respect, and the lighting of it by electricity is worthy of special mention. The system used is the United States, installed by the Western branch of that company, C. C. Warren, manager. Two generators, having a capacity of 600 lights each, generate the current. The number of lights on the stage is 268.

### Kalamazoo, Mich.

Bids for the city plant were opened Nov. 16, and were as follows: Western Electric (2 bids), high speed, $30,529; Corliss, $30,925; Sperry, Leonard & Izard, agents (2 bids), high speed, $34,165; Corliss, $36,145; Ft. Wayne Jenney, $34,500; Indianapolis Jenney, $34,435; Schuyler, $34,000; Waterhouse, $37,492; Brush, $42,565; local company (Thomson-Houston), $27,000. All 150 lights, for 35 miles of circuit.

### Telephone Quotations.

Col. S. G. Lynch, broker, 146 La Salle street, furnishes quotations upon telephone stock as follows:

| | | | | | |
|---|---|---|---|---|---|
| Bell of Mo. | $149 | @$152 | Iowa Union | $23 | @ $25 |
| Central Union | 46½ | @47½ | Michigan | 80 | @ 81 |
| Chicago | 330 | @ 335 | Missouri and Kansas | 69 | @ 70 |
| Colorado | 40 | @ 41 | Rocky Mountain Bell | 39 | @ 40 |
| Cumberland | 65 | @ 68 | Wisconsin | 115 | @ 117 |
| Great Southern | 30 | @ 35 | | | |

### Special Dynamos.

Forée Bain, electrical expert and engineer, has just completed and shipped a large special dynamo having a capacity of 60 h. p. which will be used for street railway work. This is the second one of the same size recently built by him for that service. Last week he completed two small dynamos, which will be used for special work. He has, I learn, a large amount of other special work on hand, and his shops are at present taxed to the maximum.

### Storage Batteries in Isolated Plants.

Mr. J. A. Harter, manager of the Electrical Construction Company, has just returned from a trip north in the interests of his company. At Ft. Howard, Wis., he has recently completed the lighting of the fine residence of Wm. Larsen of that city by means of storage batteries. The cells used are of the Julien type and are charged during the day from the arc light circuit of the city plant. Besides this Mr. Harter states that his company has other plants lighted in the same way and that all are running very successfully and satisfactorily.

### Wisconsin Items.

The National Electric Manufacturing Company, of Eau Claire, with a capital of $50,000, has filed articles of association; incorporators, Ralph E. Rust, David Drummond and Henry N. Hayden.

The Menasha electric light plant has been sold to the gas company, and the cities of Neenah and Menasha will hereafter be lighted by gas.

At Oshkosh, Wis., on Nov. 21, the Common Council granted a perpetual franchise to the Oshkosh Edison Light Company.

### Wellsville, O.

Suit has been brought against the City Council of Wellsville, O., by S. Cape and P. F. Smith, both heavy stockholders in the Valley Gas Company, of this place, restraining the City Council from entering into a three years contract with the Citizens Electric Light and Power Company.

East Liverpool, O., will in the near future purchase and operate its own electric light plant.

The new telephone line now being constructed connecting up Wellsville, Ohio, East Liverpool and Steubenville will, it is asserted, use the old Clay telephones with some few changes made in the diaphragm.

### Demand for Feed Water Heaters.

I found business brisk at the shops of Wm. Baragwanath & Son last week. Never before have the company had so much work on hand as at the present time. "We have a regular boom on hand," said Mr. Baragwanath. "Within the last six weeks we have sold some 4,000 horse-power of our new superheater." Among other heaters I may mention that the company have under construction, is a No. 11 heater for Louisville, Ky., besides four other No. 11's for different points in Pennsylvania. The shops are obliged to run on an average of about 14 hours per day. Heaters for a large number of electric light plants are just ready for shipment from the shops.

### Series Incandescent Light.

I learn that Mr. C. F. Dunderdale, manager of the Western department of the Waterhouse Electric Manufacturing Company that he is installing at Corning, Ia., in the station of the electric light company of that place, a long-distance series incandescent

light system, to consist of about 175 25 candle-power series lamps and a few arc lamps, all on one circuit. The lights will be used for city and commercial purposes. He states that the plant will be in operation in a few days. I am also informed that Brookings, Neb., is lighted by this same system. The Oregon Improvement Company also have a large plant of this system at Seattle, Wash. Ter., used for city and commercial lighting. The lights are said to be steady and economical.

### An Exhibition of the Phonograph.

An exhibition of the phonograph in its perfected form was given at the Grand Pacific Hotel to the representatives of the Chicago press last Tuesday evening. A soprano solo with piano accompaniment given by Miss Effie Stewart in New York three weeks ago was listened to with pleasure. The rendition, both instrumental and vocal, was but a few shades less perfect than when originally given. The new instrument gave back the sounds uttered into it with life-like fidelity to quality, and was but little short in distinctness of enunciation. Among other experiments made was one which well demonstrated the capability of the instrument to produce the quality of sounds. A number of those present talked consecutively into it and as the reproduction was made each voice was clearly recognizable and might easily have been mistaken for the actual utterance of the person.

### In the City Council.

At the meeting of the City Council, Monday night of this week, Alderman Ernst introduced an ordinance to repeal the ordinance of the Bell Telephone Company for non-user. He said that the company was a Boston corporation and ceased to do business here in 1881. It transferred its franchise, or tried to do so, to the Chicago Telephone Company, but it had not the right to make that transfer. The president of the Chicago Company, he said, stated before the finance committee some days ago that failing to secure a proper ordinance from the council and failing to establish its right to operate under the old ordinance, his company would transfer its stock to the original company, which would then revive its old ordinance. The purpose of his ordinance was to prevent this last scheme from being carried out. A motion made by him to suspend the rules for the passage of the ordinance was lost and it was referred to the finance committee.

### Electrical Supply Company.

I found business active at the store of the Electrical Supply Company this week, all of which goes to show pretty clearly the wonderful activity in electrical matters. In house goods, such as bells, push-buttons, etc., they are having a regular *boom;* in fact, they tell me they are astonished at the way orders are coming in. It is altogether a new class of trade. Orders for wires are also raining in on them at a wonderful rate. Mr. F. S. Terry, manager, informs me that he has made special arrangements with the manufacturers for the handling of the Ayrton & Perry direct reading voltmeters and ammeters, and they have at present in the store a complete line of the finest reading instruments. The company will make this a specialty, and have just completed their stock by the addition of a full line of other testing instruments, making it altogether the most complete in the country.

### An Important Tax Decision.

A decision, which is thought to be of considerable importance to the city of Chicago, was rendered on the 16th inst. by the Supreme Court. It is held in this case, appealed from the Appellate Court, that the city ordinance imposing a tax on foreign insurance companies amounting to 20 per cent. of the gross receipts in the city was invalid. The court held in the course of the decision that under its police powers the city could impose a tax for regulation. The decision has much interest at this time, inasmuch as it is thought that an effort will be made early next year to fix the price of gas, rates of telephone charges, etc. Assistant Corporation Counsel Knight interprets the decision to mean that the city has all the police powers within its municipal boundaries, and that it can, therefore, regulate the price of gas for city use, telephone charges, etc., the same as the State can fix railroad charges and tax insurance companies for purposes of regulation.

### Lighting a Mine.

A correspondent, who has just returned to St. Paul from Marysville, Mont., writes me as follows: "The installation of incandescent lights in the Drumlummon at Marysville, Mont., for the Montana Company (Limited) has been completed. The system used is the United States long distance, and although the nature of the work, with much water and damp air, was very difficult, the plant is working to the entire satisfaction of the company. There are a great many mines in that section of the country lighted by electricity, but there is much dissatisfaction on account of the poor quality of work, causing grounds, leaks, etc. The United States Company furnished the very best quality of Okonite insulated wire and make a special duplex fixture, which thoroughly sheds the water, insuring a good insulation throughout. The Montana Company (Limited) are to be commended for their generous manner of doing business, and for not sparing either money or pains to get a first-class installation; and they believe they have by far the best lighted mine in the country in consequence."

### Personal.

Mr. Geo. T. Manson, of the Okonite Company of New York, was in the city a short time this week, and made this office a very pleasant call. He reports business matters very brisk with his company.

Mr. J. F. Meech, manager of the foreign Thomson-Houston Electric Company, London, England, was in the city this week at the offices of the Western department of the Thomson-Houston Company. Mr. Meech was accompanied by Mr. J. F. Down, of the firm of Laing, Wharton & Down, electrical engineers and contractors, 82 Bond street, London.

Messrs. J. L. Barclay and A. D. Lundy, both of the Western department of the Sprague Company, are in the East for a short time.

Mr. J. M. Atkinson, of the Western department of the Sprague Company, is in the city for a few days. Mr. Atkinson has invented a switch, in use on the Lafayette electric road, just completed. It is simple in its construction and works successfully.

### Sprague Motors.

I learn from Mr. C. M. Barclay, manager of the Western branch of the Sprague Company, that the outlook for the motor in this section still continues to brighten. Among other installations on the 22d inst., a 10 h. p. motor was started up by him for the Gold and Stock Telephone Company in the Open Board of Trade Building, the current being furnished from the Edison circuit. It is used to operate three dynamos. In the new addition to the printing establishment of H. O. Shepard, 183 Monroe street, he has also installed a 10 h. p. motor, which will be used to operate several large printing presses. The shafting for this is 164 feet long, and the firm have fitted up everything in first-class manner. Mr. Shepard expresses himself as having great faith in the future of the motor for this sort of work. Another installation of a 2 h. p. motor has just been completed for Radcliff & Maney, for running printing presses. I may also add that this displaces a gas engine.

### Telephone Matters.

At the Finance Committee Council of Friday evening, President Phillips, of the Chicago Telephone Company, with his attorney, W. F. Winston, were present in pursuance of the communication referred to that body by the council meeting. Mr. Winston, in behalf of the telephone company stated that it did not appear before the committee as a suppliant for an ordinance but to avoid tedious and vexatious litigation. The telephone company denied the right of the council to regulate charges for instruments. The company to avoid bother and expense would now tender two and one-half per cent. of its gross receipts to the city for its franchise and would in addition stipulate that present charges would not be increased. Any litigation that might be carried on or any agreement that might be entered into would not interfere with the right of the city to apply to the Legislature for more extensive power for telephone regulation. His clients he said would not submit to a reduction in rates. It was finally agreed that the Committee should privately meet the Corporation Council as to the city's rights, etc.

### The Central Electric Company.

The Central Electric Company has just taken the western agency for the Auburn Watchman's Register and Fire Alarm. This clock, which has recently been put on the market, has some commendable features, among which it is claimed that it registers not only the movements of the watchman, but also shows the condition of the fire alarm each day, as the same is used for both watchman and fire alarm. Thermostats are placed in each room and the alarm is given if the temperature goes above a certain point. Among special points claimed for it is that the clock cannot be opened unless the dial indicates the time of opening. It also has an attachment that will ring a bell in the superintendent's house in case the watchman should fall asleep or otherwise fail to make his round at the proper time. Besides it is claimed that it cannot be tampered with without giving the alarm. In its sales department the company report matters very active, the demand for wire and cables being unusually brisk. Among orders for Okonite wire was one received last week for ten miles, consisting of the various sizes. Also one order received this week was for five miles of Candee wire. They report a good demand for the Applegate burglar alarm matting.

### Riverside & Suburban Railway, Wichita, Kansas.

The Wichita & Kansas Electric Railway, which was mentioned last week under your Thomson-Houston railway notes, has since that time been put into practical and successful operation. On Nov. 13, at the invitation of the officers of the road, an inspection was made by the Mayor, Council and private citizens. The trial was set down for 10 o'clock, but long before that time an immense crowd gathered on Market street and Douglas avenue, where the road starts. Shortly after 10 o'clock two cars were started, the guests having been increased by a delegation from the Board of Trade. The trip was made to the terminus of the Riverside & Suburban Railway line, and return in about one hour and a half, including a long stop for the investigation of the power station at the end of the line. About two miles and a half of railway has been equipped, and work will at once be pushed to complete the line six miles. The president, Mr. J. O. Davidson, and Superintendent Mr. F. G. Fitch, and Mr. F. W. Sweet, manager, all speak in the highest terms of the successful beginning of their electric railway, and are strong in their praise of the action of the Thomson-Houston motors and the excellence of their system in every detail.

### Burning of the Fort Wayne Jenney Factory.

A special dispatch from Fort Wayne, Ind., of Nov. 23, says: The extensive works of the Fort Wayne Jenney Electric Light Company took fire at 2 o'clock this morning and were totally destroyed. The old building containing the costly arc machinery and the engines, and the new three-story building containing the stock room, the incandescent department and the Star Iron Tower Company are a total loss. All the tools and patterns and some of the books of the company also are destroyed. The company is one of the most prominent of the arc light manufacturers in America, and has in the last three years embarked in the business of manufacturing incandescent lights and starting plants all over the United States, Canada and Mexico. The amount of capital invested is fully half a million. The loss on building, stock and machinery amounts to over $200,000. There hundred employés are temporarily thrown out of work.

The insurance is $150,000, divided as follows: Liverpool, London & Globe, $7,000; Royal, $14,000; Imperial, $3,000; Phœnix, of New York, $3,000; Home, of New York, $2,500; Springfield, $1,500, Niagara, $2,000; Franklin, $1,000; Fire Association, $2,500; California, $5,000; Liberty, $3,500; North British & Mercantile, $3,150; German-American, $3,150; Citizens', $1,500; Security, $1,250; Eureka, $1,250, Aurora, $1,000; Farmers', $1,000; Cincinnati, $1,000; Enterprise, $1,000; Western, $1,000; Marine, $1,000; National, $1,000; Milwaukee Mechanics', $2,000; Sun Fire, $3,000; Phœnix, of Hartford, $4,000; Farmers' Insurance Company, $2,000; Merchants' Insurance Company, $3,000; Germania Insurance, $1,250; Michigan Fire and Marine, $2,500; Hartford Insurance Company, $2,500; Connecticut, $1,500; Hamburg & Bremen, $2,500; Queens, $5,000; City of London, $2,500; Commercial Union, $8,000; German Insurance Company, $1,000; Phœnix Insurance Company, $2,000; Spring Garden, $3,000; National, $4,000; United Firemen's, $1,500; British-American, $1,000; Pennsylvania, $5,000; Insurance Company of North America, $5,000; American $2,500: Northern Assurance, $2,500; Glenns Falls, $2,000; Traders' Insurance Company, $5,000; Firemen's Fund, $5,000; Teutonia, $2,000; Buffalo German, $2,000. E. L. P.

## SOUTHERN NOTES.

DALLAS, Tex., Nov. 10, 1888.

### Greenville, Miss.

Greenville, Miss., will start its Edison plant in a few days, the machinery having arrived.

### Poor Pan is Dead.

The Federal Court in session at Little Rock, Ark., has just granted a permanent injunction against The Pan Company, and the instruments will forthwith be removed and destroyed.

### The Erie Telephone Company.

The Erie Telephone Company have completed their labors of reconstruction in this city and have their entire plant in splendid condition. Their list of subscribers is rapidly increasing under the able management of Mr. E. A. Baker, the Division Superintendent.

### Personals.

Mr. F. O. Richards, the popular agent of the Fort Wayne Jenney, has gone North for a brief period. His return will be awaited with pleasure.

Mr. Irvin P. Disney, the expert from the Baxter Motor Company, of Baltimore, has returned to that city after assisting Messrs. Clower & Harris with their exhibit at the State fair. Mr. Disney made many friends during his short stay in our city, and we trust that he will again favor us with a visit.

### Electric Lighting.

Dallas now rejoices in an abundance of light. Thirty-five of the fifty-five lights recently contracted for by the city have been placed by the Queen City Company, and the reminder will be placed as soon as possible. The incandescent circuits have not been started as yet, owing to the non-arrival of the necessary material. This has caused them no little annoyance, and they were obliged to reduce their working force.

The Electric Light Power and Manufacturing Company, under Mr. Miller's able management, are holding their patronage in spite of the vigorous opposition by the Queen City and the gas company. Gas was recently reduced to $1.90 per 1,000. The new 50-light Thomson-Houston placed but four weeks since is full, every one of the fifty lights being placed.

### Weatherford, Tex.

The 600-light Edison plant, recently contracted for by the Water, Light and Illuminating Company, of Weatherford, Tex., is being erected under Mr. Mottram's eye, and promises to be the most successful plant in the State. The three industries that this company engages in being under one roof, it strikes the visitor at once that the entire establishment can be maintained very economically. The boilers are of sufficient capacity to furnish steam to all parts of the vast establishment, and, as a precautionary measure, they have been duplicated. We may expect to hear great things in regard to Weatherford. Mr. Mottram returned a few days since from Laredo, and is very enthusiastic over the success of the Edison plant being erected there. Owing to the desire of the lighting company, it was necessary to extend the wires over into Mexico, lighting the city of New Laredo. This was successfully accomplished by Mr. Mottram by connecting five Edison machines in series, and putting up a five wire system —a rather unique idea.

### The Texas State Fair.

The great Texas State Fair and Dallas Exposition has closed its third annual fair. True to all prophecies it has been the grandest success throughout. The attendance has been fully up to the number anticipated, over 300,000 people passing the gates, an average of 15,000 daily. Over 3,000 exhibitor's tickets were issued, showing the unusual interest taken in it. These fairs are of incalculable value to Dallas, Texas, and the Southwest generally. Greater interest was taken this year by exhibitors than ever before, and the result was plainly seen by the immense crowds each day and the universal satisfaction expressed on all sides. On the opening day of the Fair was started the first large motor Dallas has ever had the pleasure of seeing. The proprietors of the *Times-Herald*, the leading daily of the city, decided that such an auspicious event as the opening should be celebrated in an unusual manner, and to that end purchased an entire new outfit of presses, type, etc., and then quietly contracted with Messrs. Clower & Harris, the indefatigable agents of the Baxter Motor Company, for a 4-h. p. motor, which duly arrived, and was placed in position by Mr. Disney. To say that the *Times-Herald* are pleased with the venture would but feebly express it. It was a complete revelation to them and to the thousands of visitors to the Fair. It was the objective point of all, and at times it was almost impossible to pass their exhibit, so great was the interest taken in the motor. Mr. Disney was the hero of the hour, but his honors sat easily upon him; he seemed to be used to that sort of thing. There is a large field in Dallas for motors, and the Baxter Company took time by the forelock.

Electricity played an important part in all parts of the fair. The Singer Manufacturing Company had a number of machines running from a Thomson-Houston motor. The Electric Light Power and Manufacturing Company, who had the contract for the lighting of the grounds and buildings, were unremitting in their endeavors to please their patrons and furnished an abundance of light to all. A 600-light Edison furnished the incandescents, and one 50 American, one 20-light Sperry and one 10-light Weston the arcs. The various motors in operation were all furnished current from this plant. The lighting was a perfect success, and reflected great credit on Mr. Miller, the general manager, and Mr. James Schoalfield, the superintendent. Clower & Harris were comfortably installed in County Exhibit Hall, and it is needless to say that their exhibit attracted and called forth the

admiration of every one, as it was the first exhibit of the kind ever seen in Texas. They exhibited a complete line of electrical goods from the well-known house of Partrick & Carter, and various other appliances for which they are agents. Also as agents of the Dallas Motor Company they had a complete line of the small motors manufactured by that company running sewing machines, lathes, fans, etc., which attracted the attention of the ladies especially. These motors created no little enthusiasm amongst the members of the profession, on account of their small size, speed, efficiency and tasteful appearance. They have been recently introduced, but quite a demand has been created. The exhibit was brilliantly lighted by a 125-light Colburn incandescent machine operated in the exhibit for the purpose of showing its admirable qualities. The power was furnished from the shafting of the Electric Lighting, Power and Manufacturing Company. They also exhibited a complete line of the well-known Crowdus electric street car fare boxes and batteries. One of the boxes was labeled "For the benefit of the Buckner Orphan Home," and quite a large amount was deposited for that worthy institution, as all were anxious to witness the practical working of the box. A number of the batteries were shown doing different kinds of work, and several were in use in other exhibits running revolving show cases, etc. Altogether the exhibit was a complete success, and this enterprising firm deserve great credit for their efforts in showing what Texas is doing. THE ELECTRICAL WORLD was on file at their exhibit and was read by thousands. A large number of the fraternity called and offered their congratulations. As a result of their efforts they received the first premium for the best display of electrical goods, best motor of any size, best sewing machine motor, best electric street car fare box and battery, and best system of incandescent lighting for small plants. They feel quite proud of their victory, and the result is seen in the flattering increase in the demand for electrical goods.

## THE TELEGRAPH.

**Cuba.**—A royal decree has been issued in Cuba granting a concession for a submarine cable between Cuba and the peninsula of Yucatan.

**Spokane Falls, W. T.**—The American District Telegraph Company is now thoroughly organized for business, and is pushing the district messenger system, using boxes with 11 calls. The officers are: Cyrus R. Burns, president; John W. Chapman, secretary and treasurer; W. S. Morgan, general manager, and A. B. Irwin, assistant general manager.

**Consultation by Cable.**—A special dispatch of Nov. 10, from Victoria, B. C., says: The telegraph was yesterday brought into service in a way that not only afforded a good illustration of the extent of the system, but furnished a unique example of the possibilities of modern science. Lord Ennismore, heir to the Earldom of Listowell, is lying at the point of death in the hospital here, with typhoid fever, accompanied by other complications. Through the aid of Sir Donald A. Smith, who is in London, a telegraph circuit was formed from London to Victoria by cable and land lines, and Sir Andrew Clarke, the distinguished London physician, was placed in direct consultation with Dr. Hannington in Victoria. A conversation lasting three hours concerning Lord Ennismore's condition was carried on. An unbroken circuit was worked from Victoria to the Commercial cable office in New York where the telegrams were repeated to London. Replies were received in three and four minutes.

## THE TELEPHONE.

**Telephone Taxes.**—The General Term of the Supreme Court of New York State has handed down a decision against the American Bell Telephone Company, subjecting it to taxation as a foreign corporation, and fixing the amount due at $34,419.90.

**Life Saving Service.**—Superintendent Kimball, of the Life Saving Service, proposes to erect a telephone line next March on Long Island coast, from Coney Island to Montauk Point, a distance of 108 miles, with 30 stations, the work to be done by the corps. Later on, New Jersey will be similarly equipped.

## THE ELECTRIC LIGHT.

**Laurens, S. C.**, is talking of an electric light plant.

**Tuskaloosa, Ala.**—Mr. D. F. Torbett is to put in a plant for both arc and incandescent lighting.

**Boston, Mass.**—A Citizens' Committee is agitating against the present cost of the street electric lighting.

**New Orleans, La.**—An electric light plant is to be put in for the Marine Hospital Service. Mr. C. Goldsborough can give details.

**Phœnix, N. Y.**—The Phœnix Electric Light Company has been formed by E. P. Bates and others, with a capital stock of $200,000.

**The Automatic Electric Light Company**, of this city, has been founded by R. Baldwin and others with a capital stock of $200,000.

**Fort Worth, Tex.**—The Fort Worth Electric Lighting Company has been incorporated by R. E. Maddox and others, with a capital stock of $100,000.

**Buena Vista, Cal.**—The Buena Vista Electric Light Company has been formed by J. Tipton, G. S. Wood and others, with a capital stock of $15,500.

**Green Island, N. Y.**—The Thomson-Houston Company has been granted a franchise for a plant at Green Island. It offers 16 arcs at $100 per lamp per year.

**Topeka, Kan.**—The Hill Clutch Works, of Cleveland, O., have contracted to furnish the power transmission machinery for the Thomson-Houston electric light plant to be erected at Topeka.

**Sioux Falls, Dak.**—An Edison central station plant has been started at Sioux Falls in connection with the new electric light station, under the superintendence of Mr. Oscar Ericsson. The plant now has a total capacity of 32 arcs and 1,500 incandescents, operated by six dynamos, a Ball and a Corliss engine. Very satisfactory reports are given of the plant, and the light is in great demand.

**Danville, Pa.**—The Consumers Gas Company of Danville are enlarging their station. The capacity of two 50-light American arc dynamos is already taken, and they are now installing a 700-light Thomson-Houston compensating system, which is expected to be running by Jan. 1. They have a Ball 95 h. p. engine. The borough lighting is done with 23 American arcs and 33 Bernstein incandescents of 25 c. p.

**The Eastern Electric Construction Company**, of Portland, Me., has been incorporated this month was a cash capital of $50,000. Their offices are at 24 Plum street, Portland. The directors are all well-known and influential men, being C. A. Perry and E. I. Garfield, of Boston, G. C. Moses, J. W. Wakefield and F. H. Twitchell, of Bath; J. S. Winslow and F. A. Sawyer, of Portland. The company own the following property: Bath, Me., Electric Light and Power Company; Bennington, Vt., Electric Light and Power Company; Hoosick Falls, N. Y., Electric Light and Power Company, and Miller's River Gas and Electric Light Company, Athol, Mass.

**Fort Wayne Jenney Plants.**—Since connecting himself with the Fort Wayne Jenney Company on the 20th of last month, Mr. W. J. Morrison has made a good record as special eastern agent. He has sold 1,000 lights of the Slattery alternating system to the Woodstock Electric Light and Power Company, of Woodstock, Ont. He has also formed the Northern Electric Construction Company, Limited, at Carthage, N. Y., with a capital of $20,000, and has sold them 650 incandescents and 50 arcs for Alexandria Bay, N. Y. Of this company, Mr. H. H. Mills is general manager, and Mr. Wilson Corliss, electrician. Last week he sold a plant of 70 arc lights to the Cohoes (N. Y.) Gas Company.

**The Lachine Rapids to be Utilized.**—A syndicate, consisting of the Edison Electric Light Company, Messrs. McLennan and Conway, engineers, and several Montreal capitalists, have purchased from the Mathews estate, for $20,000, the Isle au Heron, which is situated right in the centre of the Lachine Rapids. It is stated that the syndicate purposes utilizing the magnificent water power, which can be obtained by deepening the natural channel by which the island is intersected and by directing a large body of water through it by means of breakwaters and dams. The company proposes tendering for the lighting of the city of Montreal by electricity, as well as furnishing private houses, manufactories and other establishments with the light. Mr. Conway was asked how they intended conveying the motive power from the island to the shore, and replied by means of cables, but so far they had not yet decided in regard to that. They intend to begin work on the erection of dams and breakwaters immediately, and it is estimated that if this is completed they will obtain at least 250,000 horse-power. Engineers are now engaged surveying the island.—*Montreal Star.*

## APPLICATIONS OF POWER.

**Wichita, Kan.**—The local papers report the new Thomson-Houston road of the Riverside and Suburban Company as a great success. The road was installed by Mr. Edward Verstrate. The officers are: Mr. J. O. Davidson, president; Mr. T. G. Fitch, superintendent, and F. W. Sweet, manager. About 2½ miles are now in operation, and work is being pushed to complete the line six miles into the Alamo addition.

**Nevada.**—Another application of electromotive force to mining purposes on a large scale is in contemplation in this country. The Humboldt Electric Power and Mining Company has been formed in London to purchase certain mining claims from the Consolidated Esmeralda Company in the Durand Hill District, Aurora County, Nevada, and it is proposed to transmit 200 h. p. from a point distant from where the mill is to be erected by electricity. It will be generated by water power, and a portion of it will be supplied to the Consolidated Esmeralda Company.

**Watertown, N. Y.**—Watertown is to have an electrical street railway. Negotiations have just been concluded and the work of construction will be commenced at once. The road will be in operation next summer. Capt. Palfrey, Government surveyor, will report in favor of the construction of locks where needed, so as to make a transportation route by water between Dexter, at the mouth of Black River, and Brownville, four miles from Watertown. It is intended to extend the electrical railway to Brownville and thus, in connection with the river improvement, to establish a rail and water route for freight transportation to the city.

**Electric Motors at Spokane Falls.**—The Electric Motive Power Company, of Spokane Falls, W. T., has closed a lease of the motive power of the local electric light company, and is now doing a regular motor business. The company has a capital stock of $50,000. The officers are A. S. Moore, president; W. S. Norman, secretary and general manager, and J. B. Fiskin, electrician. The company have already leased motors to a large number of local concerns, their rate being $42 per month of 10 hours daily for 5 h. p., and proportionally for larger or smaller powers. A saving of from 2 to 5 per cent. on insurance is effected by those who use electric motors instead of steam power.

## PERSONALS.

**Mr. Fremont Wilson** has resigned his position in this city as general superintendent of the Julien Traction Company.

**Col. R. C. Clowry**, vice-president of the Western Union Company, has been in San Francisco, and his visit is connected, it is said, with the fight to be made by the Postal Company for equal rights over the railroad lines.

**Mr. Charles Munson**, the well-known head of the Charles Munson Belting Company of Chicago, was in New York last week, attending the conference of leather belting manufacturers, held to consider certain questions relating to the trade.

**Mr. T. A. Edison** is reported to have had a narrow escape last week, when he was thrown from his buggy at Llewellyn Park while driving home from his laboratory. The buggy was broken to pieces, the coachman was badly hurt and the horse had to be shot.

## MISCELLANEOUS NOTES.

**The Advance Electric Company**, of Saco, Me., has been formed by A. Eastman, of Boston, and others, with a capital stock of $250,000.

**The Lovejoy Company**, for electrotyping work, has been formed in this city by C. E. Kimball and others, with a capital stock of $75,000.

**The Electric Gold and Silver Chlorination Company** has been organized under the laws of Maine, with a capital of $500,000, to treat gold and silver by chlorination. Mr. Henry B Wells is president. The company claims that it can save a very large percentage of the precious metals, and proposes to furnish mining companies with machinery on lease.

## BUSINESS NOTICES.

**Jordan & Gottfried, 208 Canal Street, N. Y.**, carry a complete stock of iron and brass machine wood screws, bolt, cap and set screws, taps, dies, files, twist drills, brass and rubber tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

**The Russell & Erwin Manufacturing Company** of New Britain, Conn., desire to call the attention of dealers and electrical supply houses to their new house door checks and spring combined. The company will be glad to have such concerns handle their goods, and they also wish to bring them to the notice of telegraph, telephone and electric light companies for use in offices and stations.

**C. E. Jones & Bro.**, of Cincinnati, have lately issued a neat little pamphlet, well illustrated, telling how to build a small dynamo. The instructions are very explicit and are given in plain, simple language. If our student readers, or beginners in dynamic electricity, will take this useful little work and construct a machine on the principles and lines it lays down, they will have a mastery of science and practice that nothing else can give them.

**Herman J. Jaeger & Co.**, 45 John street, city, have issued a large catalogue and price list of their scientific and electrical glass apparatus, instruments, etc. The catalogue includes their mercury pumps, water-air pumps, glass apparatus for analysis, Hoffman's experimental apparatus, glass apparatus for distillations and miniature incandescent lamps. All the instruments and apparatus of the firm are prepared with great care, and the calibration and graduation may be depended upon.

**Messrs. Clay & Torbensen**, of Camden, N. J., are prepared to manufacture all kinds of meritorious articles, both electrical and mechanical, and place same on the market. They are agents for the Roberts-Brevoort Electric Co., of New York, and report increasing sales of the batteries of this company. Messrs. Clay & Torbensen are also sole manufacturers and general sales agents of the Copeland oil vapor burners, boilers and engines, and the Depuy electric protector, to be used on an electric circuit where there is danger of excess of current.

**Primary Batteries.**—Among our advertisements this week is included that of the Electric Fare Box Company, in which they bring out a number of novel principles in connection with primary batteries, both liquid and dry. Although much has already been done in this special branch of the business, Mr. Crowdus, the electrician of the company, is considered to have made notable advances in the important items of power, economy and duration. The company issue a handsome catalogue, fully explaining the new principles, reactions, etc., of their chemical batteries, and this catalogue should be in the hands of all who are interested in the subject. It can be obtained by writing to the firm for it.

**New Gravity Drop Annunciators.**—We call the attention of our readers to the new gravity drop annunciators illustrated on page xx. These instruments combine several new features. The backs are made of iron, and attached to the wooden frame. The drops are placed on the iron frame, and therefore cannot get out of adjustment, a very important feature. The drops are of entirely new design—magnets changed so that the lines of force act with full effect, causing very little friction and working very strongly with light battery. The well known standing of the manufacturers, the Standard Electrical Works, is a guarantee to any one that these instruments are as represented, and at the extremely low prices at which they are sold they should command a large sale.

**Ball Engines for Electric Lighting.**—The Ball Engine Company, of Erie, Pa., has recently shipped engines as follows: The California Electric Light Company, San Francisco, two 80 h. p. engines; the Xenia (O.) Electric Light Company, one 40 h. p.; the Lynn (Mass.) Gas Light Company, one 100 h. p.; the Danvers (Mass.) Electric Light Company, one 60 h. p.; John Wanamaker, Chilton Hills, Pa., one 60 h. p.; the Merced (Cal.) Electric Light Company, one 25 h. p.; the Edison Electric Light Company, Erie, Pa., two 100 h. p.; the Thomson-Houston Electric Company, Brunswick, Ga., one 80 h. p.; Eckington and Soldiers' Home Electric Street Railway, Washington, D. C., one 100 h. p.; the Jenney Electric Company, Topeka, Kan., one 80 h. p.; the Fremont (O.) Electric Light Company, one 100 h. p.; the Toledo (O.) Electric Light Company, one 100 h. p.; the Snohomish (W. T.) Electric Light Company, one 35 h. p.; the Excelsior Electric Company, New York, 235 h. p. of engines. The Ball Engine Company are running night and day at full capacity,

# OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

## PATENTS ISSUED NOV. 20, 1888.

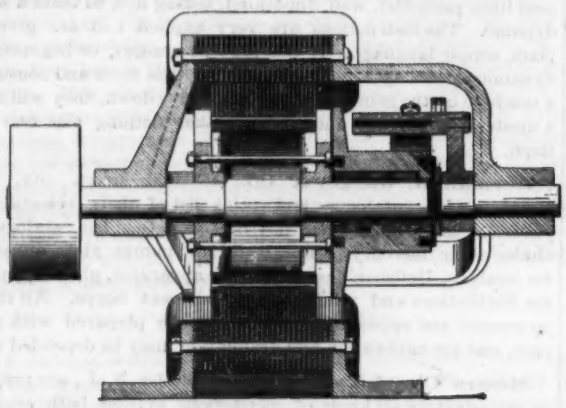
**(1) 393,012. (2) 393,013. (1) Metallic Connector for Electric Railways; (2) Conduit for Electric Conductors;** Joshua Kames, of Philadelphia, Pa., Assignor to the National Electric Conduit Company, of Camden, N. J. Applications filed Jan. 12, 1888. (1) Claim: The combination with a car or other conveyance having an electric motor of contact arms taking the current from a subway to said motor, a vertically movable support upon which said arms are pivotally mounted and carrying the electrical contacts with which they engage, and guides giving vertical movement to said support. (2) The timbers grooved longitudinally, said grooves being lined with an insulating material formed in sections and provided with supporting plates, each plate having a raised central portion in combination with an electrical conductor resting at intervals upon the supporting plates.

**393,072. Electrical Apparatus for Preventing Corrosion of Steam Boilers;** A. J. Marquand, Cardiff, England. Application filed Jan. 17, 1888. Patented in England June 10, 1887, No. 8,396. The invention relates to an improved apparatus for applying electricity to steam boilers, and other similar vessels for the purposes of preventing the formation of incrustation, of removing it if already formed.

**393,073. Transformation and Distribution of Electric Energy;** W. J. McElroy, of Pittsburgh, and T. J. McTighe, of New York, N. Y. Application filed March 12, 1888. In a system of transformation or conversion of electric energy, an alternating current generator, a pair of mains respectively connected to the terminals thereof, two electrostatic converters and consumption devices, said converters being composed each of two members of different area, the smaller members being respectively joined to said mains and the larger members connected to consumption devices.

**393,078. Electric Alarm System;** William F. Rossback, of Brooklyn, N. Y. Application filed April 25, 1888. The object of the invention is to provide a new electric alarm system, by means of which an alarm can be given at a number of different places at desired different times, or at the same time, a single clock only being required for the several gongs or alarm devices.

**393,088. Instrument for Measuring Electric Currents;** A. G. Waterhouse, Hartford, Conn. Application filed April 20, 1887. A current measuring device comprising an



393,266. ELECTRIC MOTOR AND DYNAMO.

electro-magnet having a tubular orifice in the periphery of its core, an armature located in such orifice provided with one or more angular extensions, an indicating pointer connected to one end of the armature, and a scale over which the pointer sweeps.

**393,123. Galvanic Battery;** F. H. Root, Chicago, Ill., Assignor to the Root Electric Gas Lighting Company, of Illinois. Application filed Nov. 2, 1887. Zinc and chloride of silver electrodes, a porous cup intermediate of said electrodes, and an exciting medium thickened to the consistency of paste, and forming within the cell a pasty mass wherein the electrodes and the porous cup are immersed.

**393,125. Apparatus for Removing Frictional Electricity from Machinery;** W. Schulte, Appolo, Assignor of three-eighths to Robt. D. Schulte, of Pittsburgh, Pa. Application filed June 13, 1887. An appliance for removing or conducting away frictional electricity generated in or by a plant of machinery consisting of electrical conductors arranged in as many circuits as there are individual members of the plant, combined with a switch-board and ground connections for both the machinery and the electrical conductors.

**393,132. Electric Meter;** Frank C. Wagner, Ann Arbor, Mich. Application filed Aug. 22, 1888. A meter for measuring and recording currents of electricity, two conductors adapted to expand under the influence of an electrical current, said conductors being connected electrically to an additional conductor carrying the current to be measured, with switch mechanism and connections for throwing the current successively through said expansible conductors, and recording mechanism controlled thereby.

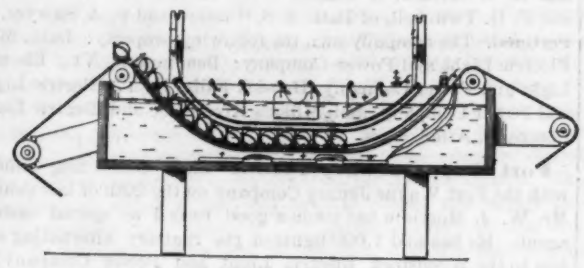
**393,146. Mechanism for Changing Electric Circuits, etc.;** H. Edmunds, London, England. Application filed July 19, 1888. Patented in England, June 15, 1887, No. 8,641. A spring or weight is wound up at intervals by the motive agent, which is periodically called into action by the revolution of the drum or a part connected therewith. For example, once or oftener during each revolution a circuit closer may be actuated by said drum to close the circuit of a solenoid, which thereupon attracts its armature. This motion of the armature thus periodically obtained may be utilized to perform the operations which it is the function of the apparatus to perform.

**393,147. Distribution of Electricity by Secondary Batteries;** H. Edmunds, London, Eng. Application filed July 16, 1888. Claim: In a system of electrical distribution, the combination with the secondary batteries, the main circuit and the working circuit of a switch or circuit changer comprising a magnet having a coil in the main circuit whereby the said circuit is diverted from the batteries, and another coil connected with the local circuit, whereby the energy of the first coil can be neutralized or confirmed by a current of the proper direction.

**393,159. Synchronizing Mechanism for Clocks;** Edward Kronenberg, Philadelphia, Pa. Application filed Sept. 22, 1887. The invention consists of mechanism for automatically closing an electric circuit running from the standard or regulating clock to the clocks to be synchronized for a short time prior to the synchronizing hour, and leaving it closed until the clocks are synchronized.

**393,165. Electro-Magnetic Shunt for Telephone Receivers;** Thomas D. Lockwood, Melrose, Mass. Application filed Aug. 10, 1888. This invention relates to means for relieving telephone instruments from the pernicious and disturbing effects of induction from other circuits. It is especially serviceable in cases where the disturbing effects accrue from circuits carrying electric light and power currents. See page 288, this issue.

**393,170. Apparatus for Electroplating;** L. McMurray, Baltimore, Md. Application filed March 1, 1887. Cans are first polished, and are placed in the bath tub, from thence

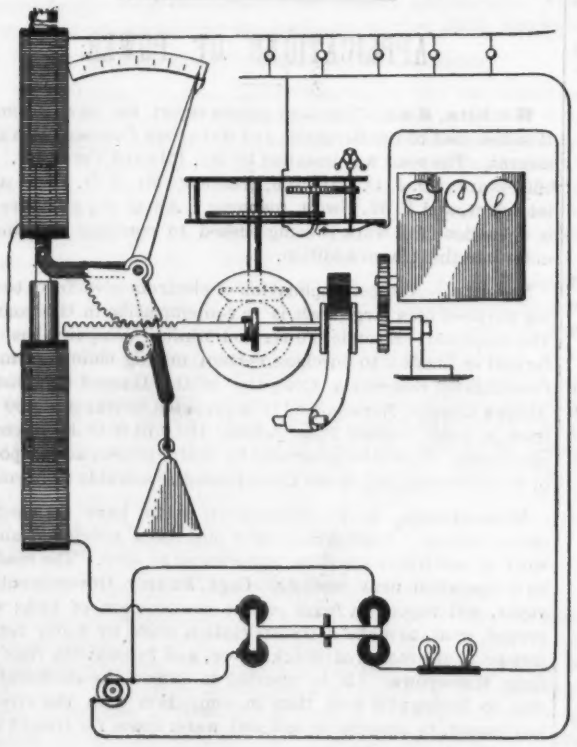


393,170. APPARATUS FOR ELECTROPLATING.

placed upon a carrier which carries them through the electro plating solution, and are then delivered to the drying device See illustration.

**(1) 393,183. (2) 393,315. (1) Time Switch for Secondary Batteries; (2) Electric Meter;** Wm. F. Stocker, Burrton, Kan. Assignor of one-half to W. O. VanArsdale, of same place. Applications filed May 25 and 16, 1888, respectively. (1) This switch consists essentially of two terminals movable with respect to each other, one being longer than the other, and a clockwork which moves one of the terminals over an adjustable conducting strip and maintains contact for the desired time. (2) Claims 3 and 4 are as follows: 3. The combination with an electric generator of electric lamps in the circuit thereof and an electric meter in the same circuit, the said meter acting through mechanism controlled by clockwork, of a shunt or short circuit including an automatic circuit breaker operating on the circuit first described, the said circuit being kept open when the clockwork is in motion, but being closed automatically when the clock stops, as and for the purpose set forth. 4. In an electric meter, a plurality of solenoids having their cores rigidly connected together, but magnetically insulated from each other, in combination with registering apparatus controlled by the movement of the said cores. See illustration.

**393,192. Electrical Revolving Brush;** Russell Thayer, Philadelpha, Pa. Application filed Sept. 7, 1887. In combination, an electric motor, a brush attached to and revolving



393,315. ELECTRIC METER.

with said motor, a source of electric current supply and means to connect said electric current supply with the motor.

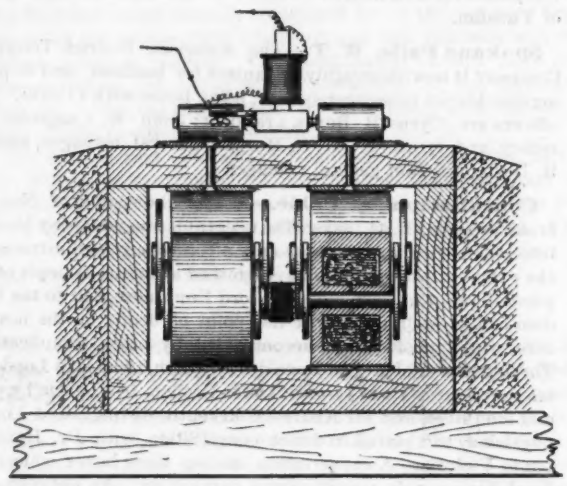
**393,203. Gravity Battery;** L. C. Bartley, Cambridge, O., Assignor of two-thirds to W. Quinn and A. T. Wikoff, of same place. Application filed May 31, 1888. A receptacle is located so as to catch the zinc oxide from the zinc element.

**392,224. Electric Railway;** S. D. Field, New York, N. Y. Application filed April 5, 1884. The invention consists in constructing a railroad with an intermediate or central line of rails designed to supply the currents to the moving train and in dividing this central rail into short detached insulated sections, which are supplied with electricity from a stationary generator by means of an electric conductor extending along the entire line, which is connected at intervals with the separate sections through branch conductors. In each of these branches is included a device for interrupting the connections with the particular section to which it leads, provided a current of too great strength is caused to traverse the same.

**393 243. Telephone Apparatus;** John B. Kerr, of Harrisburg, and John Crawford, of Reading, Pa. Application filed April 14, 1887. The bell and transmitter cases are constructed air tight and of metal, which will itself resist deleterious atmospheric influences, or will have its surface coated with a protecting material.

**393,266. Electric Motor and Dynamo;** A. L. Riker, New York, N. Y. Application filed Nov. 1, 1887. An armature for electric motors and dynamos, comprising a series of flat stamped out rings having teeth and intermediate spaces for the coils and rivet holes opposite alternate teeth, each ring being composed of two like halves joined at their ends, the rings being reversed alternately with reference to their top and bottom, so that adjacent rings break joints. See illustration.

**(1) 393,275. (2) 393,276. (3) 393,277. (4) 393,278. (5) 393,317. (1) Closed Conduit for Electric Railway Conductors; (2) Underground Conduit for Electric Conductors; (3) Turnout and Crossing for Underground Conduits; (4) Switch for Overhead Conductors; and (5) Arched Suspender for Overhead Electric Conductors;** C. J. VanDepoele, Lynn, Mass. Applications filed respectively March 12, 1887; April 22, 1887; June 9, 1888, and Aug. 22, 1888. (1) A main conductor extending along the line of way, a traveling contact in circuit with said conductor, and a traveling magnet device in inductive proximity to and controlling the movement of the traveling contact. (2) Two carriages traveling upon and making contact with completely separated conductors contained within the one conduit, the carriages themselves being, however, united by a coupling of non-conducting material, so that they will at all times travel together without being capable of forming a short circuit between the main conductors upon which they rest and travel. See illustration. (3) The invention consists in providing special conductors at intersecting points, said conductors engaging some portion of the contact device to support and guide it in the desired direction and at the proper height, while the exterior carrying devices pass over or through the open spaces in the exposed portion of the conduit formed by intersecting slots. (4) A switch for electric conductors, comprising a contact plate or surface and conductors in electrical connection therewith, said conductors being cut to allow the passage of a traveling contact device between their ends and in contact with the plate. (5) The device embodying the principal feature of the invention is called an "arched suspender," and a prominent feature of the improvement resides in the fact that the conductor is by means thereof supported in the same transverse



393,276. UNDERGROUND CONDUIT FOR ELECTRIC CONDUCTORS.

plane as the cross wire, and therefore cannot tilt its immediate support, whatever the desired position of the conductor.

**393,280. Electric Railway System;** David G. Weems, Baltimore, Md., Assignor to the Electro Automatic Transit Co., of Baltimore, Md. Application filed June 11, 1888. The invention relates to certain improvements in electric railway systems for transporting mail, express packages, etc., at a high rate of speed over a line of elevated surface, or underground tracks or rails, having the motor or motors located in a traveling car or locomotive to which a train of cars is attached, the said train being supplied with means for controlling, starting and stopping itself.

**393,282. Electro-Magnetic Door Opener;** E. A. Wildt, Long Island City, N. Y. Application filed June 20, 1888. In an electric door opener a magnet and armature, the sliding keeper controlled thereby, a pivoted spring throwing plate arranged to bear against the door, a lever attached to the sliding keeper, and a connection between the throwing plate and lever, whereby the parts are reset by the movement of the throwing plate.

**393,304. Electric Gas Lighter;** Chas. H. Haskins, New York, N. Y. Application filed June 7, 1887. A gas burner, a primary electric circuit, and a thermostatic strip, the strip serving to complete the circuit through the burner when cold and to open the circuit when heated, and a secondary electric circuit for igniting the gas when the primary circuit is completed.

**393,323. Switch for Electric Motors;** G. H. Condict, of Philadelphia, Pa., Assignor to the Electric Car Company of America, of Pennsylvania. Application filed April 26, 1888. The invention embraces two electric motors, a source of electric supply, a controlling switch for coupling up the coils of the motors in different orders to vary the resistance offered by said motors, a reversing switch to reverse the current in the motors, and a lock controlled by the movement of the controlling switch to lock said reversing switch from movement at times, except when the controlling switch is moved to cut the normal current out of the motors.

**393,337. Electro-Magnet;** F. A. Lane, New Haven, Conn., Assignor of one-half to Frank E. Morgan, of same place. Application filed Jan. 30, 1888. The invention consists of a magnet composed of a tubular metal core, wire wound upon said core, and said tubular core closed at one end to form the active or contact surface of the margin.

**393,346. Electrical Conduit;** John Whelan, Washington, D. C., Assignor of one-third to James Nolam, same place. Application filed July 25, 1888. An electrical conduit formed of interchangeable plates removably joined together to form the top, sides and bottom of the conduit.

*Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, N. Y.*